

FLIGHT

The
AIRCRAFT ENGINEER
AND AIRSHIPS

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EDITORIAL COMMENT



Our Airship Policy

THE Government has at last announced what is to be its policy with regard to continuing airship work. In short, it amounts to holding a watching brief while Germany and the United States push ahead and see what future lies before the airship. We are not to close down, but we are not to push ahead. Above all, we are not to spend much money. The National Physical Laboratory is to continue its investigations into airship problems which have not yet been fully explored. R100 will be kept in flying trim and will be used to verify the results of the laboratory conclusions, and also to keep the crew and airship staff in practice. She is not to undertake any ambitious flights, and she is not to be enlarged or otherwise structurally altered. Apparently, though Mr. Montague did not actually commit himself on that subject, she is to continue to use hydrogen, and will not be changed over to helium. Thus, Great Britain will not drop out of the airship movement. We shall gradually increase our knowledge, perhaps very materially increase it, and we shall keep the crew of R100 and the maintenance staff at Cardington in working practice. All this we shall get for £140,000 per annum.

The greatest airship enthusiast could, in present circumstances, hardly have hoped for more than this. The greatest airship pessimist could hardly have expected that we should do less. The Cabinet seems to have chosen the perfect middle course, and they have gained the approval and support of the other front benches, notably of Sir Samuel Hoare and Sir John Simon. In the course of the debate on the subject in the House of Commons it became increasingly obvious that no other course was really possible. The Prime Minister said that there were three possible courses of action. One was to set up the 1924-30 programme and continue to build new ships, and so on. The second was to scrap everything; and the middle course was to keep the organisation going more in the nature of a scientific investigation than anything else. No doubt the

DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

- 1931
- May 23. Start of Whitsun Continental Cruise, Heston.
 - May 23-25. Inter-Club Gliding Rally, Balsdean, Sussex.
 - May 24. N.F.S. Air Pageant, Nottingham.
 - May 25. Scarborough Ae. C. Opening Meeting.
 - May 25-26. Northamptonshire Ae.C. Flying Meeting at Sywell.
 - May 28-June 13. Royal Tournament at Olympia.
 - May 30. Air Union Reception of Capt. Costes, Croydon Aerodrome.
 - May 30. Heston-Newcastle Air Race, for "Newcastle Evening World" Trophy.
 - May 31. N.F.S. Air Pageant, Sherburn-in-Elmet, Yorks.
 - June 2. R.A.F. Middle East Dinner at Connaught Rooms.
 - June 3. Reception to Delegates of International Air Navigation Commission, at Park Lane Hotel.
 - June 5-6. Scottish Flying Club Air Display, Glasgow.
 - June 6. Brooklands Air Display.
 - June 6. Lincolnshire Ae. C. Meeting at Cleethorpes.
 - June 7. N.F.S. Air Pageant, Hull.
 - June 8. International Rally, Bucharest.
 - June 9. Air League "Speed" Ball at the Dorchester, Park Lane, W.
 - June 13-14. Leicestershire Ae.C. "At Home" at Desford Aerodrome.
 - June 20. Flying Display and Air Pageant, Bristol Airport.
 - June 21. N.F.S. Air Pageant, Reading.
 - June 26. R.A.F. Dinner Club Annual Dinner, Connaught Rooms.
 - June 27. Royal Air Force Display, Hendon.
 - July 10-19. Circuit of Italy.
 - July 22. Household Brigade Flying Club Meeting, Heston.
 - July 25. King's Cup Race.
 - July 25-Aug. 9. Rhön Gliding Competitions, Germany.
 - Sept. 5. Haldon Flying Meeting.
 - Sept. 12. Schneider Trophy Contest.

second course had its attractions for a Cabinet which is very hard pressed for money. It is to the credit of Mr. MacDonald and his colleagues that they decided the question on higher considerations than that. The Prime Minister delivered himself of an epigram which, while in itself almost a truism, is often overlooked. He said: "In these days of financial stringency what can be saved must be saved, but sometimes saving is a form of very short-sighted extravagance." With these words he condemned the economy campaign of 1920 when airship activities were for the time closed down and all aeronautical progress in this country was brought to the verge of ruin.

Breaks in the continuity of progress are always harmful, especially in the case of aeronautics. We may take the example of high-speed work. France and the United States dropped out of competition for the Schneider Trophy, and both have found it very difficult to make up the leeway. Italy has kept at that work continuously since 1926, and, consequently has always been formidable. We only started scientifically on that work in 1927, and we have kept at it ever since; though it is only through the generosity of a private individual that Mr. Ramsay MacDonald has not this year been guilty, in his own words, of very short-sighted extravagance. British airship policy has suffered more than most forms of activity from lack of continuity. Sir John Simon said in the course of the debate: "I do not suppose that there has been any modern enterprise which has been so much interrupted, and so much the subject of chops and changes, as the airship policy." Major Church added that we had carried out a magnificent experiment with interruptions.

The best speech in the debate was made, as we should have expected it to be made, by Sir John Simon. He was very well advised, while supporting the proposals of the Cabinet, to mention in clear non-technical language the three great problems which airship experts have to face, namely, lift, power and speed, and unwieldiness in handling on the ground. The last of the three seems to us the most difficult, and we have no information as to whether the experiments at Cardington with the movable mooring mast are to proceed. We hope that they are. Sir John explained how increase of size improves the proportion of lift; while, of course, progress with the heavy-oil engine must in any case be pursued. Sir John gave as his reason, or one reason, for supporting the Government's plan the following consideration: "I think that we ought to regard airship transport and development as an international problem—not as an opportunity merely for developing a national service in rivalry with or at the expense of other people, but as an attempt by civilised mankind to do something more to make use of the brains and courage of men and of the character of the world in which we live. . . . But, if we want to do it, we must pay our way. We cannot expect America and Germany and other countries to afford us the full advantage of their progress and development if we do not do something ourselves."

Sir John Simon made one concrete proposal, namely, that one member of the Air Council should be a man whose principal qualification was very high scientific attainment in the branches of science

specially concerned with airships. The Air Council, naturally, is composed of aeroplane experts, and Sir John made a very telling remark when he said that though the atmosphere and the wind are the same for both classes of aircraft, so far as the cover, the gas-bags, the wires and the valves are concerned, "these are things in which a man skilled in the use of aeroplanes has no more reason to be considered an expert than anybody else." This fact is too often forgotten by the Press and the public when unreasonable attacks on airships are launched by writers in the Press who are only aeroplane experts. Still, we are not very much impressed by Sir John's proposal. Airships are still in an experimental stage, and while in that stage they are best left in the hands of those who devote themselves to a study of the subject. All those who can claim to be airship authorities are best employed in pushing on with the investigations. In the days when Sir Alliott Roe and Captain Geoffrey de Havilland were evolving their aeroplanes, it would not have been reasonable to take one of them and place him as a critical authority over the other. Mr. Montague explained that for airship purposes Cardington was the Air Ministry. Wing-Commander Colmore was the Director of Airship Development, head of an Air Ministry Directorate, and it would not have been practical politics to place another authority over him. It is a necessary condition of a novel experiment that the experimenter must for the time being remain the only authority on the subject. When airships have made good, as they still may do, then the idea of an airship Member of Council may well be revived.

One of the features of the Government's plan which most commends itself to us is that it ensures continuous practice for the crew of R100. Once, after bringing R100 to the tower in very difficult weather, Squadron-Leader Booth remarked: "No one in this country has had much airship experience for the last ten years." One of the weakest points of the late airship programme was that it allowed the older ships, R33 and R36, to be broken up so soon as the pressure-plotting flights had been completed. Some riggers were entirely new to airship work when they began to take their places in watches on the two new and very large ships. Booth's remark was an admission that even very skilled officers could get rusty after long periods aground, which is only to be expected. It is true that the crews very quickly learnt their duties, and on many occasions the officers showed great skill in manoeuvring the ships up to the tower head, but it would have been better if they had all been in flying training. It is not quite fair to compare their efforts with the landing of the "Graf Zeppelin" at Cardington, for that was made in very perfect weather, but it is admitted that the constant practice of the German crews, and particularly the coxswains, has given them advantages which our men have not had. The crew of R100 has now been aground since last September, and that has not done them any good. Continuity in flying practice is almost as necessary as continuity in research. There must be further time expended on very careful re-conditioning of R100. When that has been completed, we hope to see her in the air once more.



THE TOUR OF FRANCE

In our issue for May 8 we published an account of the start from Orly of the Tour of France. Below, our Correspondent describes the finish of this Tour—with the results of the speed contest—but at the time of writing the results of the Take-Off and Landing Competitions were not available



A view of the Grand Stand at Orly on the concluding day of the Tour of France, May 10.

AFTER covering a Tour of some 8,000 miles (13,000 km.), which took them all round France, 39 of the 42 Tourist planes which started from Orly in the "Tour of France" on April 25 returned again to that airport on Sunday morning (May 10) in perfect condition.

As previously related in *FLIGHT*, the planes took off from Orly under trying conditions. A strong head wind was blowing, and frequent rain squalls, with foggy weather, were encountered on the first section of the "Tour" between Orly and Nantes, and one of the contestants, the Lorraine Hanriot 10 plane, flown by Guertiau, was overturned by the wind on landing at Chartres and obliged to retire. The weather was, in fact, so bad that the managers of the Tour announced that the regulations requiring the arrival of the planes at Nantes that same day would be suspended, and an additional twenty-four hours granted to reach there without penalisation. A number of the contestants, having landed at Chartres and le Mans owing to the weather prevailing, availed themselves of this privilege, and did not arrive at Nantes until Sunday, the day following. From there on, however, the Tour proceeded as planned, and, notwithstanding that bad weather was encountered at times, the planes traversed their whole itinerary without a hitch.

As previously recorded in *FLIGHT*, the Tour—lasting 17 days—consisted of nine easy stages between the principal cities of France, flown, with one exception, every other day, the non-flying days being spent in exhibiting the machines and in various entertainments in honour of the competitors.

The eighth section of the Tour ended at Douai on May 8, where the contestants were received by the Aero Club du Nord, of which Mr. Jacques Breguet, a brother of the well-known Constructor, is the President. A large luncheon was served in the City Hall, which was attended by the Préfet of the Department, the Mayor of Douai and other prominent personalities of the District. Mr. Etienne Riche, the Assistant Air Minister, came up from Paris by plane, and a squadron of 11

Belgian tourist machines, from the Aviators' Club of Brussels, also flew to Douai to meet the visiting air tourists. Captain Frank M. Hawks, the American ace, likewise arrived from Paris on his speedy Travel Air monoplane, on which he gave a very interesting exhibition at the airport of la Brayelle (Douai).

The final section of the Tour, which was held on May 10, consisted of a race from Douai to Orly, a distance of 118 miles (190 km.). It was the only speed contest of the Tour. The position of the contestants was judged by the formula $\frac{V}{P}$, in which V represents speed and P the H.P. of the motor per passenger. The start from Douai was scheduled from 7 a.m., but, owing to the fog and thick weather conditions, the first plane, a Farman 231, equipped with a 95-H.P. Renault, piloted by Lalouette, was not sent away until 10.29. He was the first to arrive at Orly, reaching there at 11.25 a.m., having traversed the distance from Douai at an average speed of 185.4 km. (115 miles) per hour. As Lalouette only carried one passenger, however, he was beaten on the number of points by Massot, who piloted a Guerschais cabin monoplane, also equipped with a 95-H.P. Renault motor, who carried two passengers, flying at a speed of 154.8 km. (96 miles) per hour. Reginensi arrived at the Orly airport shortly after



Spectators watching manoeuvres of the Observation Group planes from the Naval Centre, at the Orly Meeting on May 10.



The winner of the Speed Contest of the Tour of France. The Guerchais type 12 (95 h.p. Renault) monoplane and its pilot Henry Massot.

Lalouette, and was quickly followed in turn by Hebelin, flying a Farman 231, carrying one passenger, and by Avignon, who piloted a Farman 190, with four passengers.

Other planes followed in quick succession, one of the features being the arrival of 12 Potez 36 cabin monoplanes, equipped with 95-H.P. Renault or Salmson motors, flying in a semi-circular formation headed by René Labouchere, the Chief Pilot of the Potez Co. Captain Frank M. Hawks flying his "Texaco No. 13" monoplane, reached Orly at 12.05 p.m., having come from Douai in 35 minutes, and five of the Belgian planes that had met the Tour at Douai also came on to Paris. All the pilots had "checked in" at Orly by 1.15 p.m.

The position of the competitors, their elapsed time from Douai to Orly, speed, etc., will be found in the accompanying table.

Two official planes, in addition to the contestants, accompanied the Tour. One, a Lorraine Hanriot, equipped

with a 230-H.P. Lorraine motor, was piloted by Marcel Haeglen, the well-known War Ace, and President of the "Union des Pilotes Civils." M. Haeglen was the Commissaire General of the Tour, and to his good judgment and untiring efforts its great success is, in a large measure, due. The other official plane, a Caudron 232 (95-H.P. Renault), carried the Commissaires of the Tour, MM. Gaston Brabant and Arrou, who looked after the details of taking care of the pilots on their arrival at the various cities, and ably seconded M. Haeglen in the many details of his duties. The Tour was also accom-

panied by the "Columbia" plane, a Farman 190 (230-H.P. "Titan"), which transported a Jazz band consisting of four members in bright blue uniforms, who gave entertainments throughout the Tour. These were greatly appreciated, and voted an excellent accompaniment to the trip.

The Guerchais cabin monoplane, piloted by Henry Massot, the well-known test pilot, winner of the Speed Contest, is of a type especially suited for Tourist use. It carried comfortably throughout the "Tour of France" the pilot and two passengers, together with their baggage, weighing 100 lb. (45 kg.). This plane, which is constructed of wood throughout, has a maximum speed of 109 m.p.h. (175 k.p.h.), a cruising speed of 93 m.p.h. (150 k.p.h.), and lands at 45 m.p.h. (70 k.p.h.). The ceiling is 4,500 metres (15,000 ft.). The fuel tanks, which are installed in the wings, have a capacity of 35 gallons (150 litres) of petrol, which furnishes a flight radius of 470 miles (750 km.). The wings are of cantilever construction with a spread of 39 ft. (12 metres) and a total surface 215 sq. ft.



Some of the Potez 36 monoplanes lined up after arriving at Orly on May 10.

TOUR OF FRANCE: SPEED RACE DOUAI TO ORLY—118 MILES (190 KM).

Position.	Pilot.	Machine.	Time Seconds.	Speed. K.p.h.	H.P. per Passenger.	Number of Points.	Position.	Pilot.	Machine.	Time. Seconds.	Speed. K.p.h.	H.P. per Passenger.	Number per Points.
1	Massot ..	Guerchais ..	4,366	154.08	31.60	487	21	Grillot ..	Morane ..	4,489	149.76	60.0	249
2	Avignon ..	Farman 190	3,919	171.72	38.2	449	22	Vaillant ..	Caudron 232	5,682	118.44	47.5	249
3	Herbelin ..	Farman 231	3,619	185.76	47.5	391	23	Malinvaud ..	Moth ..	6,445	104.40	42.5	245.8
4	Lalouette ..	Farman 231	3,620	185.40	47.5	390	24	Maryse Bastie	Caudron 230	5,857	114.84	47.5	241.7
5	Arcaute ..	Caudron 193	4,152	162.00	47.5	340	25	de Rovin ..	Potez 36 ..	5,860	114.75	47.5	241.5
6	Chmedlin ..	Moth ..	4,680	143.64	42.5	338	26	Camion ..	Potez 36 ..	5,880	114.48	47.5	241.2
7	Coadou ..	Farman 232	4,058	165.60	50.0	331	27	Maloine ..	Caudron 230	4,674	144.00	60.0	240
8	Maryse Hilez	Moth ..	4,819	139.68	42.5	318	28	Ripault ..	Potez 36 ..	6,093	110.16	47.5	231
9	Lefolcavez ..	Moth ..	4,963	135.36	42.5	318	29	Durandean	Potez 36 ..	6,145	109.44	47.5	230
10	Lardy ..	Farman 231	4,494	149.76	47.5	315	30	Mergoz ..	Potez 36 ..	6,220	108.00	47.5	227
11	Lebeau ..	Moth ..	5,040	133.56	42.5	314	31	Labouchere	Potez 36 ..	6,256	107.28	47.5	225
12	Maurens ..	Farman 190	3,872	173.88	57.5	302	32	Lietard ..	Potez 36 ..	6,297	106.56	47.5	224
13	Roulin ..	Caudron 232	4,890	137.52	47.5	289	33	Lhuillery ..	Potez 36 ..	6,293	105.12	47.5	223
14	Mauler ..	Caudron 128	5,907	113.76	40.00	284	34	Cendre ..	Potez 36 ..	6,444	104.40	47.5	219
15	Perrier ..	Caudron 232	5,017	133.92	47.5	281	35	Collin ..	Potez 36 ..	6,508	103.32	47.5	217
16	Max Andre ..	Caudron 230	5,134	131.04	47.5	275.8	36	Blanger ..	Potez 36 ..	6,601	101.88	47.5	214
17	Chalze ..	Caudron 230	5,135	131.00	47.5	275.8	37	St. Cierge ..	Potez 36 ..	8,226	81.72	47.5	172
18	Pharabod ..	Caudron 232	5,245	128.88	47.5	271	38	Marot ..	Potez 36 ..	9,690	69.48	47.5	145
19	Moreau ..	Farman 204	4,786	140.40	55.0	258	39	Vercruysse ..	Potez 36 ..	13,132	51.12	40.0	127
20	Legendre ..	Caudron 232	5,566	120.96	47.5	256							

The Travel Air "Texaco 13" monoplane of Capt. Hawks created much interest at the Orly Meeting. Gen. Bares, Chief of Air Service (left), and Gen. Poli-Marchetti (right) are here seen discussing the machine.



(20 sq. m.). The length of the plane is 23 ft. (7 metres) and the height is 2.3 metres (7 ft. 4 in.). It is equipped with a Renault 95-H.P. 4-cylinder in line air-cooled motor. This engine has a bore of 115 mm., a stroke of 140 mm., and weighs 297 lb. (135 kg.).

The Farman 190, the cabin monoplane which was rated second in the speed contest, transported six persons; the pilot, mechanic and four passengers. It was equipped with a 230-H.P. Jupiter "Titan" air-cooled motor. This type of plane equipped with this motor has made a number of successful long-distance flights during the past eighteen months, and is well known to readers of FLIGHT. It was piloted through the "Tour of France" by its owner, M. Marcel Avignon, of Montpellier, the President of the Aero Club of Hérault.

The plane finishing third in the speed contest was a Farman 231, a two-seater open cockpit low wing monoplane, equipped with a 95-H.P. Renault air-cooled motor (described in FLIGHT, January 23, 1931). It was flown by André Herbelin, an enthusiastic amateur tourist pilot, who was accompanied by a friend, the plane thus carrying two persons. One point only separated it from the machine finishing fourth, which was also a Farman 231. This last plane was flown by Marcel Lalouette, the well-known Farman pilot, who has lately established several long-distance records to his credit.

Réginensi, who was flying a Farman 230, a two-seater open cockpit monoplane (40-H.P. Salmson), damaged his plane by hitting a log of wood lying unnoticed on the field of the Macon Airport. He obtained another plane of the same

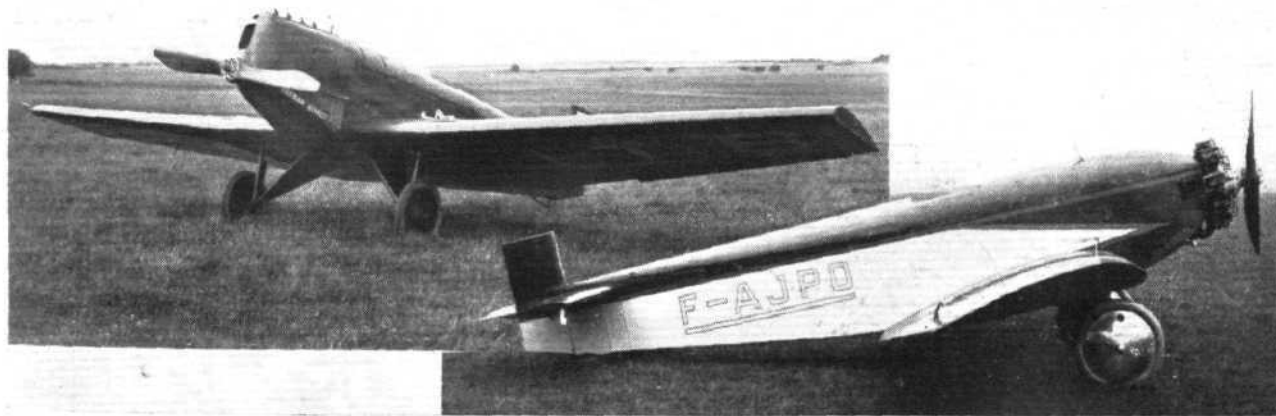
make and continued on with the Tour, but was eliminated from the competition.

De Bimard, who was flying a Moth Morane two-seater open cockpit plane, 85-H.P. Gipsy, injured one of his wings on landing at Pontarlier and abandoned the Tour there.

An interesting Aviation Meeting on Sunday afternoon followed the arrival of the planes at Orly. A series of evolutions were performed by squadrons of pursuit planes from the 34th Regiment of le Bourget and of observation planes from the Naval Centre at Orly. Captain Hawks exhibited the speed of his "Texaco No. 13" plane, and Boussotrot and Rossi, the international long-distance record airmen, encircled the field in their Bleriot 110, the machine in which they made their endurance flight. A number of other well-known planes were also exhibited.

M. J. L. Dumesnil, the Air Minister, arrived early, and was an interested spectator. He inspected the planes that had taken part in the Tour and personally greeted many of the contestants as he passed from one machine to another. The Minister was accompanied by M. Etienne Riche, the Assistant Air Minister, General Bares, the Chief of Air Service, and General Poli-Marchetti, the Chief of his Military Cabinet. There was a large attendance of constructors, engineers and pilots.

R. C. W.



TWO FARMANS IN THE TOUR OF FRANCE: On the left is the type 231 monoplane (95 h.p. Renault), and on the right the type 230, a similar machine fitted with a 40 h.p. Salmson.



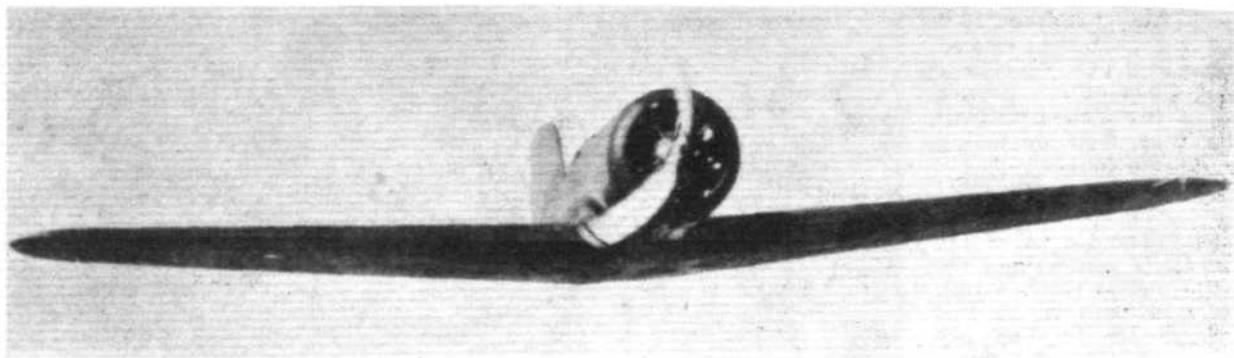
The High-Speed Flight

FROM the Supermarine works of Vickers (Aviation), Ltd., the first of the reconditioned high-speed racing seaplanes, the Supermarine Rolls-Royce S.6, was delivered on May 19 to Calshot Air Base, where the R.A.F. Schneider Trophy team are in training for the 1931 contest. This particular machine is the "N-247," the winner of the event in 1929, when flown by the late Flight-Lieut. H. R. D. Waghorn, A.F.C., and was used by Squadron-Leader A. H. Orlebar, A.F.C., who again is commanding the British team, when he established the world's speed record of 357.7 m.p.h. on a specially-measured course between Fawley and Calshot. It is anticipated that the modifications which have been effected both to the machine and to the Rolls-Royce engine will be productive of an increased speed. Mr. R. J. Mitchell, who is again responsible for the design of the two new "S.6" seaplanes, is naturally reticent as to the nature of the improvements

which have been effected, also with regard to the progress of the additional machines. It may, however, be stated that the position in each case is regarded as being very satisfactory. The sister plane of "N-247," which was piloted in the 1929 contest by Flight-Lieut. R. L. R. Atcherley, is being modified on similar lines, and in about two weeks' time the high-speed flight at Calshot will be in possession of both the 1929 racers for training and practice flights.

British Airman's Success at German Meeting

MR. A. C. M. JACKAMAN won three events out of six in his Puss Moth at the first international flying meeting at Aix-la-Chapelle. He also led the winning team in the relay race, and was first in the long-distance race, in the landing competition, and in another race. About 80 British, Dutch, French, Belgian, and German pilots competed.



The new Lockheed "Altaire" with retracted undercarriage.

SPEED

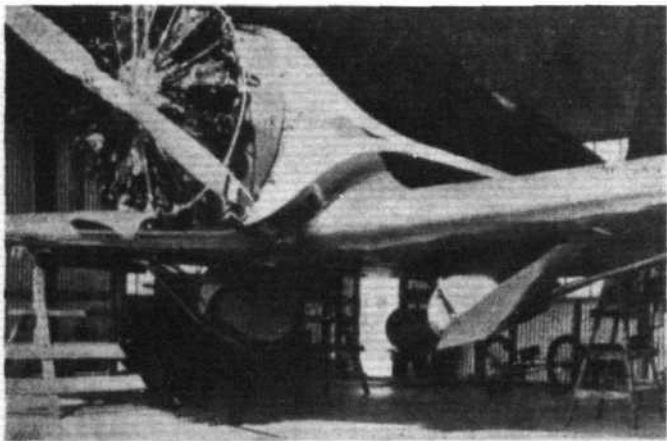
FOLLOWERS of American aircraft will have noticed that several of their machines come near to fulfilling the requirements recently asked for in the Air Ministry specification for a mail-carrying aircraft. We have been able to secure details of some of these, and this week give a little information about the new Lockheed machines.

The Vega is now produced as a speed model, and the specification shows that it has a payload somewhat more than the 1,000 lb. asked over here, with a cruising speed of 190 m.p.h., although the range is only 600 miles. The other two new models are ostensibly the same aircraft, but with different type fuselages. The "Orion" is a cabin monoplane seating seven people, while the "Altaire" is a two-seater open cockpit machine. Both these are low-wing monoplanes having a retractable undercarriage, and their chief features are typically Lockheed.

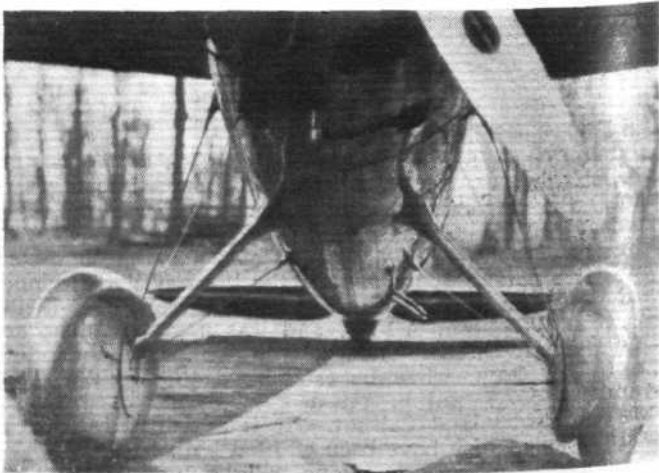
The speed model "Vega" has the fuselage built in wood or metal, as desired, and incorporates the new-type undercarriage of low drag. The "Orion," in particular, certainly looks as if, with a little adjustment of load to include more fuel and less payload, the range could be put up very close to 1,000 miles, and that, with a cruising speed of 191 m.p.h.

Specifications and Performance

	Speed Vega	Orion	Altaire
No. of seats ..	7	7	2
Span ..	41 ft.	42 ft. 10 in.	42 ft. 10 in.
Length overall ..	27 ft. 6 in.	27 ft. 6 in.	27 ft. 6 in.
Height overall ..	8 ft. 2 in.	9 ft.	9 ft.
Wing area, sq. ft. . .	275	275	275
Weight, empty, lb.	2,700	3,200	3,000
Pay load, lb. . .	1,182	1,290	610
Gross weight, lb. . .	4,500	5,200	4,600
Fuel capacity, gall.	96	106	150
Engine ..	P. & W. Wasp, Sup. D.	P. & W. Wasp, Sup. D.	P. & W. Wasp, Sup. D.
Max. H.P. at 2,200 r.p.m. at 7,000 ft.	500	500	500
Wing loading lb./sq.ft.	16.4	18.9	16.7
Power loading lb./h.p.	9.0	10.4	9.2
Range—miles	600	650	900
High speed m.p.h. at 7,000 ft.	221	224	227
Cruisg. spd. m.p.h. at 1,850 r.p.m.	190	191	193
Landing speed m.p.h.	61	64	61
Climb at sea level ft./min.	2,200	1,850	2,300
Service ceiling, ft.	26,000	23,700	27,000



Two views showing the undercarriage operation of the "Orion" and "Altaire."



The new low drag undercarriage on the "Speed Vega."



I.L.I.S.: The main exhibition building is seen on the right. On the left is the tent hangar occupied by the Finnish exhibits. (FLIGHT Photo.)

I.L.I.S.

The Stockholm International Aero Show May 15-31, 1931

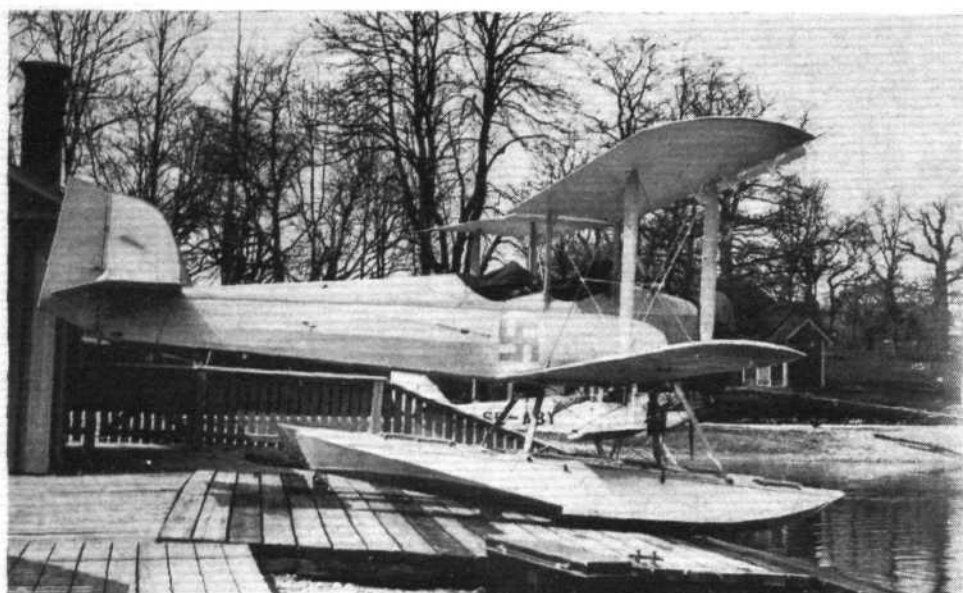
The International Aero Exhibition in Stockholm was opened by His Majesty King Gustav of Sweden on Friday, May 15, when he paid a visit to the Exhibition and examined with great interest the aircraft, aero engines and accessories and equipment staged on the stands and in the grounds

HERE is no gainsaying the fact that the Stockholm Aero Show is a small affair. But it is also very attractive from many points of view, not the least attraction being provided by the fact that the exhibition is being held not in a large hall in the centre of the city, as is usually the case, but in the maritime air port of Stockholm, at Lindarängen. Some confusion appears to exist in this respect, due probably to the fact that Lindarängen is often quite erroneously referred to as "the aerodrome." There is no aerodrome at Lindarängen. It is true that about a quarter of a mile

away there is an open space which resembles a golf course, but which is full of shallow gulleys, ridges, hillocks, etc., and crossed by several roads. By no stretch of the imagination could this piece of ground be described as an aerodrome, although Captain Rawson is going to make an attempt to take off from it on the Autogiro. If he succeeds, it will be very much a feather in the cap of the Autogiro Company, for no normal aircraft could hope to get away safely. If he fails and damages his machine, as well he may, it will be nothing against the machine. Even the Autogiro cannot be expected to achieve the impossible.



SWEDISH GIPSY MOTH SEAPLANE: In the background may be seen a small portion of the Free Harbour of Stockholm, which adjoins the seaplane station. (FLIGHT Photo.)



INTENDED FOR TRAINING: This Finnish seaplane, which has a Siemens engine of 120 h.p., has wooden floats of very excellent workmanship. (FLIGHT Photo.)

But all this is by the way. The point to be kept in mind is that there is no aerodrome near the exhibition. Stockholm has, of course, its air port, but that is situated a considerable distance away.

Lindarängen has a small bay, in which the seaplane station is situated, the bay being known as Lindarängsviken. Here is the commercial seaplane air port of Stockholm, and from here operate the Swedish air lines which run north to Finland. Also stationed here are a few Swedish "Moths" fitted with floats, and during the exhibition these habitués help to enliven the proceedings. A large hangar belonging to the seaplane station has been turned into an exhibition building, and is flanked on one side by two large tent hangars, one of which is empty, and on the other by a small open square, at the back of which is the seaplane station restaurant. The square faces the little bay, and from it one obtains a fine view of the machines leaving and arriving. Along the fourth side of the square is a short line of smaller tent hangars, one of which is inhabited by what the Swedish newspaper *Dagens Nyheter* calls the greatest technical achievement of the I.L.I.S., i.e., the Cierva Autogiro. In other hangars are a couple of Swedish "Moths," landplanes this time.

The large tent hangar adjoining the exhibition building has been taken in its entirety by the Finnish Government aircraft workshops, which exhibit two seaplanes, a large military type and a smaller training machine.

France is represented in the Lindarängsviken by an *escadrille* of C.A.M.S. flying boats, type 55, three in number, from the decks of which one hears floating across the water snatches of French songs, the while the crews ferry themselves to and from the shore by means of pneumatic doughnuts.

On the day before the opening of the exhibition, Germany was only represented by such Junkers seaplanes, single-engined and twin-engined, as either have their home port here or else call *en route* to other places. On the afternoon of Friday (the opening day), however, a Heinkel amphibian with Pratt & Whitney "Wasp" engine made its appearance above the exhibition, and, after a couple of turns (one right-handed, against all the regulations), the machine alighted and taxied up to the beach, there to be moored and, one assumes, remaining for the duration of the show. It was learned afterwards that the pilot was Herr Von Gronau, of Atlantic fame.

Before dealing with the exhibits in the main building, it

may be of interest to mention that the Royal Aero Club of Sweden had had the very fitting idea of presenting to the city fathers (or their Swedish equivalent) a monument erected in honour of Swedish pilots who have given their lives in the cause of aviation. This monument, in the shape of a bronze eagle with upraised wings, has in its base an urn containing tablets with the names of those lost in flying accidents. General Amundson, President of the Royal Swedish Aero Club, dedicated the monument in a few words, and the unveiling ceremony was then performed by H.R.H. Prince Carl. While the ceremony was in progress, Captain Hawks came over on his "projectile," and swooped down at terrific speed, disappearing in a no less spectacular "zoom." Knowing a little of the nature of the country around, one could hardly fail to contemplate that, in case of engine failure, there would almost have been time to add a tablet to those already deposited in the base of the monument.

Fortunately, no such alarming occurrence took place, but one must admire the courage of a man who is willing to fly over Sweden in such a high-speed land machine.

When the unveiling ceremony had taken place, His Majesty King Gustav of Sweden arrived at the exhibition, and, after a tour of inspection, I.L.I.S. was duly declared officially opened. His Majesty made a very thorough tour of the stands, and did not fail to visit and inspect the British exhibits, which appeared to interest him considerably.

Turning now to the actual exhibition, France and Germany have made their respective stands national in character, while Czecho-Slovakia and Great Britain have followed their individualistic inclinations, as has also Sweden, whose contribution is, naturally enough, the largest in the Show.

Great Britain at I.L.I.S.

It seems a pity that Great Britain did not make a better effort to be represented in Stockholm. This applies more particularly to those firms in the British aircraft industry which produce light planes and light-plane engines. Sweden is a country of long distances, and the light plane, especially the light seaplane, should be a very attractive proposition. Aerodromes are few and far between, and fields large enough to afford reasonable facilities for making safe landings in an emergency are also scarce. Lakes, on the other hand, are numerous, while rivers abound. Sweden strikes one as a seaplane pilot's paradise, and it is a little saddening to see no British light seaplane moored in Lindarängsviken, other than the two or three "Moths" which "live" here.



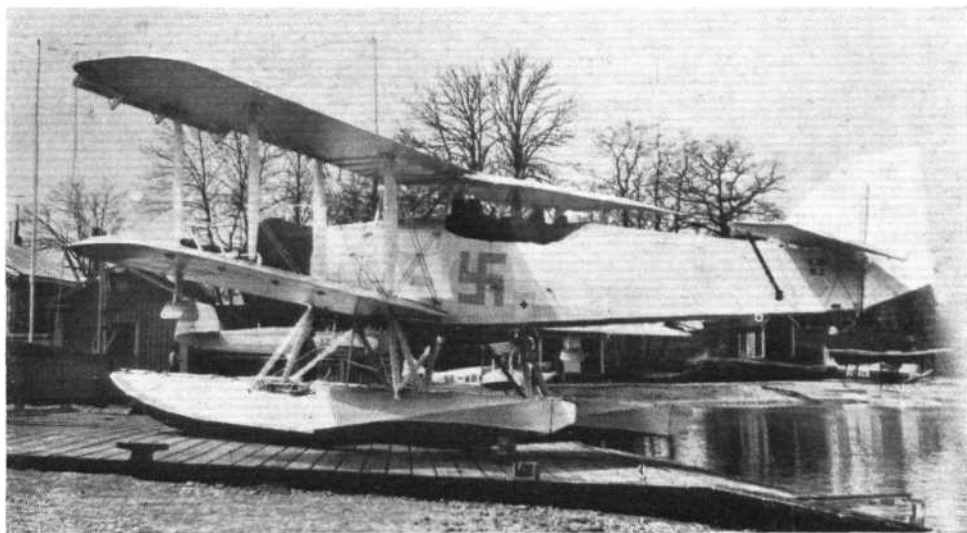
THE SERIOUS SIDE: A three-engined Junkers seaplane belonging to the Swedish Air Transport Company. (FLIGHT Photo.)

In the main exhibition building there is no British aircraft at all. The aero engine firms are confined to Armstrong Siddeley and Bristol. The former show a "Panther," a "Double Mon-goose," and a "Lynx," all very beautifully finished in aluminium and blue. The Bristol "Mercury" is exhibited by Bristol's Swedish representatives, Nydquist & Holm. After a first quick walk around the exhibition, one is left with the impression that these two firms complete the British exhibits. This, fortunately, is not the case, for, on closer inspection, one comes across quite a number of other representatives of British industry. On the Vacuum Oil Company's stand, a Reid-Sigrist pilot-testing apparatus is always the centre of attraction, and there is a constant stream of visitors desiring to have their aptitude for co-ordinating" hands and feet tested. Another old friend is the Curtiss wind tunnel flying model, which was shown by the Shell Company at the Savoy Hotel, London, some months ago. This also intrigues the visitors, who appear to love to sit in a draught of wind and jiggle the controls, the while the little model performs strange antics.

Of instruments, S. G. Brown & Co. exhibit a turn indicator of the Venturi type, and another of the electric type, as well as a pitch azimuth indicator. Smith & Sons' instruments are "incessantly expected," but at the time of writing have not yet arrived, although they are reported to be on the way.

The Sandviken Steel Works show samples of Boulton & Paul steel spars, ribs, etc., but by far the most imposing exhibit on this stand is a steel ribbon more than 200 ft. long, some three feet wide, and about 1/32 inch thick. This steel band is claimed to represent a world's record, and is cold rolled, hardened and tempered. For their work on the structure of R 101, Boulton & Paul rolled some very long lengths of tube, but evidently the Sandviken Works could produce strip of even greater length, although whether they could do so as a commercial proposition is, perhaps, another matter.

In the *Tekniske Afdeling* one finds, among other things, a model aeroplane fitted with slots, an electrically driven fan providing the necessary draught. Unfortunately, the fan was not, when we saw the model, in line with either of the slots, so that, when the angle of the model was increased, the slots very sensibly remained closed. Visitors were obviously somewhat puzzled. The initials "H. P." were painted on the rudder of the model, and so not even German visitors made the error of assuming the inactive slots to be of the Lachmann variety.



A FINNISH MILITARY TWO-SEATER SEAPLANE: This machine is built by the Finnish Government Aircraft Works, and is fitted with a Bristol "Jupiter IV" engine. (FLIGHT Photo.)

In the tent hangars are, as already mentioned, a Cierva Autogiro carrying the registration letters G-ABGA. It is fitted with Armstrong Siddeley "Genet Major" engine, and is a normal type in every way. It was shipped to Stockholm, as the stages to be covered between aerodromes were rather longer than could be comfortably contemplated. The Cierva Company is busy giving demonstrations throughout Europe, and at Stockholm a representative of the Danish paper *Politiken* was endeavouring to persuade Captain Rawson to give a show in Copenhagen when the I.L.I.S. closes. Whether it will be possible to work this in remains to be seen. In spite of the fact that it is shown in one of the tent hangars, the Autogiro is never without visitors, and the questions asked are such as to make one realise that a fairly good knowledge of the Autogiro principle exists. Doubtless this will be increased when, shortly, Colonel Josselyn gives his lecture on the development of the Autogiro. This lecture is one of several to be held during the exhibition.

The Home Industry

It has been mentioned that Sweden's contribution is the largest at the I.L.I.S. Space does not, unfortunately, permit of a complete list of all the Swedish exhibits, and we must confine ourselves in this article to a brief mention of the Swedish aircraft exhibited.

Svenska Aero A.B. show a single-seater fighter known by the name *Jaktfalken*. This is not a new machine, having been produced a couple of years ago, but it is probably exhibited here for the first time in public.

The Swedish branch of the Junkerswerke, A.B. Flygin-dustri of Malmö, exhibit the twin-rudder two-seater fighter which was illustrated in *FLIGHT* about a year ago. This is a Junkers type K.47, fitted with Jupiter engine, and is an all-metal low-wing braced monoplane, the object of the twin rudders obviously being to give the rear gunner a better field of fire over his tail.

The Centrala Flygverkstaden of Västerås exhibit a three-seater seaplane with typical Heinkel fines. This machine is shown partly sectioned, the wing being of the all-wood variety, while the welded tube fuselage is stripped to show the vast equipment carried on board.

It is interesting to discover that the Swedish railway works have taken to aircraft construction. (We may yet live to see aeroplanes being produced at Swindon.) The aircraft section of the A.B. Svenska Järnvägsverk-städerne has produced, and is ex-



NOT AN EXHIBIT: Another "Moth" seaplane whose home is at Lindarängen. (FLIGHT Photo.)



MILITARY FRANCE: Three C.A.M.S. 55 flying boats at moorings in Lindarångsviken. (FLIGHT Photo.)

hibiting, what may be termed the Swedish interpretation of a combined Dessoutter-Puss-Moth-Widgeon. This machine is a three-seater cabin monoplane, with inverted Hermes engine, and is quite an attractive looking craft. The wings, which are designed to fold back, are braced by Vee struts, and the undercarriage is arranged as in the Puss Moth, but the telescopic struts do not act as air brakes. The machine already carries a "sold" label, and it will be interesting to see whether this Swedish home product will gain popularity.

Czecho-Slovakia

No Czecho-Slovak aircraft is exhibited, but the Walter firm make a very imposing show with a complete range of aero engines, no less than six types being shown, covering a range of powers from 85 to 700 h.p. The types are: a "Vega" 5-cylinder of 85-95 h.p., a "Venus" 7-cylinder of 110-120 h.p., and a "Mars" 9-cylinder of 145-160 h.p. These three have cylinders, pistons, etc., in common. The next series comprise the "Regulus" 5-cylinder of 185-220 h.p., and the "Castor" 7-cylinder of 240-340 h.p. And, finally, in a class by itself, is the large 9-cylinder "Atlas" of 600-700 h.p. The engines look remarkably well, and are gaining in popularity.

Finland

It has already been mentioned that Finland has taken a complete large tent hangar. In it are exhibited a larger military two-seater seaplane fitted with "Jupiter IV" engine, and a smaller training machine with 120-h.p. Siemens engine. In addition to these two complete machines, which are used for giving demonstrations occasionally during the exhibition, there are shown, as one might expect from a country like Finland, some remarkably fine examples of woodwork, such as seaplane floats, propellers and skis, etc. These are all products of the Finnish Government aircraft factory.

The French Exhibits

France has no aircraft in the actual exhibition, but in the bay are moored three C.A.M.S. 55 flying boats which flew up from Calais, arriving in formation. They are military types, manned by French Naval Air Service personnel, and strike a somewhat military note in an exhibition which is, on the whole, very pacific in character.

French aero engine firms are well represented, the combined stand showing a 650-h.p. Hispano-Suiza, a radial Lorraine air-cooled type 47D. of 300 h.p., a Lorraine type 72 12-cylinder Vee water cooled, a Gnome Rhone "Titan"

5-cylinder and a 7-cylinder, and two Salmson radials, air cooled. The Renault firm are represented by the little 95-h.p. 4-cylinder air cooled and a 500-h.p. water-cooled 12-cylinder Vee type.

Germany

In the exhibition building, but one German aeroplane is shown. This is a Junkers "Junior," with Siemens engine, and appears to be the same machine, partly stripped, exhibited at Paris last December. This time, however, it has two wheels instead of a wheel on one side and a float on the other.

On the opening day a Heinkel amphibian arrived, and is now moored in the bay. This is a commercial machine, a flying boat monoplane, with a Pratt & Whitney "Wasp" (German-built one presumes), mounted above the wing and driving a tractor airscrew, the blades of which pass just ahead of the windscreen. As, however, the machine is of the *conduite interieure* type, this probably does not inconvenience the pilot very much, but the task of picking up moorings, even with the help of the mooring hatch provided in the bows, cannot be very comfortable with an airscrew running just behind one. A pair of "mudguards" have been added to the chines from bow to step, being in the form of thin sheet metal slightly curved. In anything of a seaway they would probably quickly be damaged, but it is to be assumed that the machine is mainly intended to operate from fairly smooth water.

Among the German aero engines shown, pride of place must be given to the Junkers "Juno 4" heavy-oil compression ignition engine. This engine is already known to readers of FLIGHT, and has 12 pistons working in six cylinders, the pistons being opposed to each other. The engine is of enormous depth, but, on the other hand, the width is not great, so that probably in a fairly large machine the engine can be fairly well streamlined. It is, as recorded in FLIGHT recently, now in use on a Junkers machine operated by the Deutsche Luft Hansa.

Of other German aero engine firms the Argus Company is showing one of their As.8 inverted light plane engines, while the Siemens Company is showing two radial air-cooled, a small 5-cylinder low-power type and a large 9-cylinder of some 600 h.p.

In addition to the Junkers "Junior" machine and the engines mentioned, the German stand contains a number of models and some very good photographs. Among the models the most interesting is, perhaps, that of the Focke Wulf "Ente."

Civil Aviation in Ireland

MR. W. R. ELLIOT, late of the R.A.F., has now joined the Irish Aero Club as full-time instructor, so we may expect to hear of the issue of a crop of A licenses (printed in two languages—Gaelic and English, and referred to in a third—profane) by the Aviation Section of the Department of Industry and Commerce in the near future. No news has been heard of the Iona National Airways recently; we heard that a start was to have been made on May 1, but up to the present nothing appears to have materialised. The Desoutter Mk. 11, belonging to this organisation, is rumoured to have been exchanged for a

D.H. Moth, but no aerodrome has yet been established. Apart from the comforting news that "the matter is being considered by the Department," nothing further has been reported with regard to Johnstown aerodrome, Co. Wexford. When Government Departments get busy on the problem we may expect something definite in 1932, or possibly 1933. A General Election appears to be looming on the horizon, and will probably take place before the end of this year. Will any prospective member, in his kindness of heart, take pity on those who are interested in the progress of the country, and support their repeated demands for a subsidy for Civil Aviation?

Private Flying & Club News

READING

Washed Out but
not a
"Wash Out"

THE weather is such a hackneyed topic of conversation that it ill behoves us to start our article with it, but the meeting at Reading was so successfully carried through in spite of bad weather that we must be forgiven if we do so on this occasion. It rained the whole day through, and people had to huddle into the hangars, the club-house verandah, and the tea tents, in fact, into every available space where they could get a roof over their heads.

In spite of this, however, the afternoon brought with it aircraft in amazing numbers, and at one time there were nearly sixty lined up before the club-house. Many of these were genuine private owners, and, together with the representatives of the trade, they made a most imposing show.

There were examples of many types, starting with the Westland-Wessex (three 7-cylinder Genets); and progressing downwards with the old Fokker (Jarge as it is now affectionately known, due to its registration letters G-AARG), which Messrs. Steed, Bishop, Makgill bought for £35; Puss Moths; Avians; Moths; Klemms; a Fiat; the Redwing; an Autogiro; a Bluebird; and an ancient Westland Woodpigeon.

Lord Northesk was present with Lady Northesk, and in his capacity as President of the Club he made a formal speech of welcome to Colonel and Mrs. Shelmerdine, who came over in a Puss Moth, and asked the former to open the Club. This Col. Shelmerdine did with a gold key, after expressing the hope that the Club's future would be of the best. Lord Northesk also presented both Colonel and Mrs. Shelmerdine with membership cards, and asked them to accept membership of the Club.

Councillor Sainsbury, who spoke a few well-chosen words of welcome, is the Mayor of Reading, and has set an excellent example to other local dignitaries by becoming a member.

The chief event of the afternoon was a race for ladies. This was divided into heats with Miss Aitken, Miss Crossley and Miss Amy Johnson in the first, and Miss Burr,



THE OPENING CEREMONY: Lord Northesk making his speech before handing the key to Col. Shelmerdine, who is on the extreme right.

Miss Gower, Miss Giles, Mrs. Young, Miss Slade, and Miss Spooner in the second. The winner of the first heat was Miss Amy Johnson, with Miss Aitken second, and of the second heat Miss Burr, followed by Miss Gower. These four then took part in the final, which was a victory for Miss Aitken, with Miss Gower second, Miss Johnson third, and Miss Burr fourth. Capt. Dancy, that king of handicappers, was once again to be seen, complete with stop watch, red flag, and gum boots, and his work augured well for future races this year. Only a few seconds separated the winners in each heat, although the speeds of the machines varied widely, and the final was a masterpiece of handicapping, only ten seconds covering those racing.

	Start.	Finish.	Speed.	Place.
Miss Burr ..	0 00	14 54	79	4
Miss Gower ..	2 28	14 45	95½	2
Miss Aitken ..	2 42	14 44	97½	1
Miss Johnson	2 55	14 52	98½	3

The course was a triangular one around Wokingham Church and Twyford Station, the heats being one and the final two laps, the latter being about 20 miles.



SOME OF THE COMPETITORS (L. to R.): Miss Amy Johnson, Miss P. Gower, Miss Spicer, Miss Burr, Miss Slade, Miss Winifred Spooner, and Miss Crossley.

After the race Mrs. Sheldermine presented the winner, Miss Aitken, with the cup, which had so kindly been given by the President, Lord Northesk. The second and third were made members of the Club.

The rest of the flying with which the public were entertained was in the nature of demonstrations by the pilots of various firms, although there were also several excellent aerobatic displays.

Amongst those who demonstrated machines were:—Flt.-Lt. H. M. Schofield, the Autogiro (Genet Major); Flt.-Lt. N. M. Russell, the Redwing (Genet II); Mr. S. A. Thorn, the Avian (Hermes II); Flt.-Lt. J. D. Armour, Avian (Gipsy II); Mr. F. J. Brunton, Wessex (three 7-cylinder Genets); Mr. J. Rogers, Fiat (Fiat), and Klemm (Salmson); Mr. H. Buckingham, Puss Moth (Gipsy III); Mr. B. Dick, Bluebird (Gipsy I).

The aerobatic displays were given by Flt.-Lt. Armour in a club Moth, and Mr. S. A. Thorn in an Avian (Hermes). The former cut the daisies with his wing tips, and showed just how crazy crazy-flying can be when the pilot really knows what he is doing. Flt.-Lt. Armour is probably the most expert pilot in the country at this particular form of amusement, and we were glad to see that he now combines a lot of showmanship with his skill, as all his "stuff" was done out on the aerodrome, where everyone could see it, and he never came anywhere near endangering the onlookers by getting too close or over them.

Mr. Thorn put up an equally fine show of a different kind. His was pure aerobatics, and his manoeuvres are always extremely cleanly carried out. In a roll he never corkscrews, but keeps the fuselage absolutely horizontal. His loops are perfect circles, and his wonderful control of the machine is exemplified in every manoeuvre he makes.

Mr. Powis had evidently foreseen the possibility of rain being the meteorological office's present for the day, as he had arranged for an excellent band to provide music for



THE REWARD: Miss Aitken receiving the Cup from Mrs. Sheldermine.

used for dancing, and several bedrooms. A long verandah in front makes an excellent place for the members to have tea or lunch when the weather is fine, and though the outside gives one the impression that it is not very large, yet inside there seems to be oceans of space. The En-Tout-Cas Co. now have a very live aviation department, which deals with anything from erecting hangars and club-houses down to the actual preparation of the aerodrome surface. This department is in charge of Mr. R. H. S. Brown, who, by way of gaining a real knowledge of what aerodromes are like and what is required, took a trip round the world and saw hundreds of aerodromes; his views on the subject carry, therefore, an immense amount of weight.

With such a club-house as this to go to, we imagine that there will be no difficulty in getting an even greater number of members than it will be possible to cater for, and so, before very long, we hope to see the Reading Club launching out with yet another club-house. They have already a very large number of members taking flying instruction, and the staff of instructors under Flt.-Lt. Bate-man are kept busy from dawn until dusk.

BROOKLANDS.—The repair section of Brooklands Aviation is now working overtime every night, and overhauled machines are being delivered to every part of the country. On Thursday, May 14, a gang from this section was sent to Ireland to repair a damaged machine.

During the week two new private owners took delivery of their machines, and four C. of A. renewals were completed. Two pupils completed their first solo flights, and the school machines flew over 40 hr. during the week.

The School now numbers on its rolls three who are probably the oldest flying pupils in the world. First, there is Zaro Agha, the 157-year-old Turk; Big Chief White Horse Eagle, who is 108 years old; and Sir Horace Plunket, a mere "child" of 75 years.

The display on June 6 is, of course, taking all the surplus energy of everyone at Brooklands, and it is hoped that the show itself will even surpass the success of the opening show last year. It will be remembered that on that occasion there were some 100 visiting machines, and the whole programme went without a single hitch. The ground control was on that occasion ably carried out by Mr. J. Jeffs, and was, as one can well imagine, a stupendous task. He managed, however, to satisfy everyone and to maintain an excellent degree of safety. Barring one or two minor exceptions, he found all pilots only too willing to co-operate with him and to obey his instructions, but we visualise the time when he will require a complete staff of aerial police to assist him, if the shows at Brooklands are going to continue growing at the rate they are doing.

THE LONDON Aeroplane Club.—The Club at Stag Lane is now operating seven days a week, and those who have been in the habit of considering Monday as a closed day should remember this new arrangement.

Cross-country flying is now being encouraged, and

those who wished to dance in the club-house, and naturally this forethought was taken full advantage of.

Another provision which added greatly to the pleasure of all those enthusiasts who lined the aerodrome in their cars was the broadcasting installation; this was made use of to explain all the aerobatics and demonstrations, and was a job which Mr. E. C. Brown, W. B. Dick & Co., the Ilo oil people's representative, excelled himself in as usual.

The club-house is worthy of special mention, since it has been designed specially for the job by the En-Tout-Cas Co., Ltd., of Syston. It is a long, low building, and provides, besides a dining-room and bar, a spacious central hall, which may be

approved members are quoted special rates for mid-week trips to the Continent.

Determined efforts are being made to cope with the mud, which has made Stag Lane very much a quagmire during the winter, and it is hoped that before long matters will be easier for the pilots in this respect.

CLUB FLYING IN INDIA.—Another of India's ruling Princes has qualified as a pilot and bought his own aircraft. H.H. the Maharajah of Jodhpur qualified for his "A" licence at the Delhi Club on March 21. On March 22 he bought his own machine, and on March 23 flew down to Jodhpur. Such an action should do a great deal to encourage further enthusiasm with regard to flying in India, and we hope will give the lead to many other of the ruling Princes to take to the air.

The Delhi Flying Club is extending its activities widely, and it is hoped that flying training will commence at Lucknow and Cawnpore early in June.

The flying hours for the month of March for five of the Indian clubs were:—Bengal, 177 hr. 55 min.; Bombay, 225 hr. 5 min.; Karachi, 195 hr. 35 min.; Punjab, 70 hr. 10 min.; and Madras, 74 hr. 45 min.

THE SCARBOROUGH Aero Club.—The opening meeting and pageant of the Scarborough Aero Club, which is being held on Whit-Monday, May 25, has received a large number of promises of support, and its success would appear to be assured. The club offers a hearty welcome to any private owners or others who will assist them. A long and interesting programme has been arranged, while the subsequent evening's entertainment is guaranteed not to be dull.

The proximity of the Aerodrome to the sea and to the town make it a great attraction to week-end air visitors, and already quite a large number of these have taken the

opportunity of going there, and have told us that the facilities afforded are excellent.

THE PAGEANT AT TOLLERTON.—The Nottingham Flying Club will be holding a pageant on Whit Sunday, May 24. This will be opened by Sir Harold Bowden, and Lady Bowden will distribute the prizes.

Machines will be arranged in a special park, where the general public will be able to inspect them.

F/O. Johnson, from the C.F.S. at Wittering, who put up such wonderful inverted flying displays last year, will give a demonstration on the Blackburn Bluebird. F/O. Leech will demonstrate the Martlet, and Flt.-Lt. Schofield the Autogiro. Mr. George Murray, who needs no introduction, since he is undoubtedly the finest club-trained aerobatic pilot in the country, will also give a show. Flt.-Lt. Staniland will be there with a Fairey "Firefly," and there will also be representatives with most of the standard commercial machines.

A reliability race over a 100-miles course, open to private owners, will be carried out at 75 m.p.h., the course for which will only be handed to the competitors just before starting time.

A club members' efficiency competition will also be held, open only to members of the Nottingham Flying Club, Yorkshire Aeroplane Club, Hull Aeroplane Club, and Leicestershire Aero Club. Mr. Raymond Quilter will also make a parachute descent.

LEICESTER Aero Club.—Private owners who are interested in competitions should turn their attention to the programme which has been arranged by the Leicester Aero Club. They have issued a little card giving dates up to the end of September of a large number of competitions which they have organised. The joint Hon. Secretaries are Mr. S. and Mr. R. H. S. Brown, and inquiries should be directed to them at the Aerodrome, Desford.

SYWELL.—The Pageant to be held by Northampton Club at Sywell will be sure to be one of the outstanding shows of the year, and will be extended over Whit Monday and Tuesday. Flying readers should not miss the "cheery show."



"PER ARDUA AD TURREM."

Mrs. Sykes and Capt. Broad redecorating the Club-room of the Household Brigade Flying Club at Heston.

FLYING IN SCOTLAND.

—The Scottish Flying Club are co-operating with the Glasgow Civic Week Committee to give a display of aircraft on Friday, June 5. Co-operation of the R.A.F. has also been obtained, and Imperial Airways will be sending a machine for joy-riding.

Mr. G. Murray, whose aerobatics are so well known, will be giving a display, and there will also be a glider exhibition by the Glasgow Gliding Club.

On Saturday there will be joy-riding, and the R.A.F. squadrons will give their display, starting at 2 p.m.

On Sunday the Scottish Club will carry out a further programme, which will be in the nature of a send-off to the Service contingent.

CINQUE PORTS Flying Club.

—The Cinque Ports Flying Club put in 21 hr. 45 min. flying time for the week ending May 16. They were particularly gratified by the result of the Ladies' Race held at Reading, as Miss Aitken, the winner, was a member of the club, and took her ticket at Lympne last summer. Prominent members who have recently joined the club are Lady Drummond Hay and Col. the Master of Sempill.

THE LONDON-NEWCASTLE Air Race.

—Entries to date for the race from Heston to Cramlington include:

Machine.	Engine.	Pilot.	Entrant.
Monocoupe	G-ABBR	Warner ..	J. E. Carberry ..
Moth ..	G-AADA	Gipsy I ..	J. D. Irving ..
Puss Moth	G-ABGX	Gipsy III ..	A. S. Butler ..
Spartan ..	G-AAHA	Hermes II ..	F. G. Gibbons ..
Moth ..	G-ABAG	Gipsy I ..	T. C. Fawcett ..
Spartan ..	G-AAHV	Hermes I ..	A. U. Tomkins ..
Moth ..	G-EBLX	Cirrus II ..	W. B. Ellis ..
Puss Moth	—	Gipsy III ..	W. L. Runciman ..
Moth ..	G-EBZE	Cirrus II ..	E. H. Freshfield ..
Spartan ..	G-AAGO	Cirrus III ..	G. H. Stainforth ..
Avian ..	G-ABED	Hermes II ..	Miss W. Brown ..
Klemm ..	G-ABCI	Cirrus III ..	D. Kinnaird ..
Puss Moth	G-AAVC	Gipsy III ..	A. Jackaman ..
Civilian	G-ABFJ	Genet Major	Capt. G. Pennington ..
Coupe	—	—	—
Civilian	G-ABFI	Genet Major	Capt. I. W. Mackenzie ..
Coupe	—	—	—
Hendy 302	G-AAVT	Hermes II ..	E. W. Percival ..
Moth ..	G-AAHP	Gipsy I ..	W. L. Hope ..



"MAN" HANDLING: A lady pupil of the Lasco Flying School, Melbourne, getting out a Bluebird (Genet Major).



Gliding

PORTSMOUTH AND SOUTHSEA Gliding Club.—The first annual General Meeting of the Portsmouth and Southsea Gliding Club was held at the Sussex Hotel, Portsmouth, on May 1. The report showed that since the start of the club's operations, sixteen "A" pilot certificates had been obtained.

The storm which swept the south coast last year practically destroyed the club's three training gliders, and cost a very heavy amount for repairs. One complete machine was, however, assembled from the bits, and the rebuilt fuselage of another will soon enable a second machine to be in commission.

Mr. George Knight has been elected Chairman of the Club; Councillor Webb, Vice-Chairman; Mr. Finley Day, Hon. Secretary; Mr. Yelf, Assistant Hon. Secretary; Mr. L. Limpany, Ground Engineer; and Mr. M. L. Puttick, Ground Captain.

During the last two Sundays a large number of successful glides have been made from the top of the hill, and several members are ready to qualify for their "B" certificates.

THE SAILPLANE CLUB.—Gliding will be carried on by the Sailplane Club at Smalldole on Whit Monday, as well as Sunday.

Those who wish to go down and visit the club should apply to the Hon. Secretary, Mr. E. G. Smettem, 2, Wine

Office Court, Fleet Street, E.C.4, for a small road map which will enable them to reach the site easily.

SOUTH ESSEX Aero Club.—Many good flights were made from No. 2 hill during the week-end, despite the somewhat discouraging weather. During the afternoon the wind direction changed, and another hill, which had not previously been used by the club, was tried. From here a still greater number of excellent flights were made.

Mr. Hitchcock, one of the club's members, was busy with a cinema camera, and they have found great instructional value from showing pupils films of their flights afterwards, so that they are able to see themselves making various small mistakes.

During the whole of the Whitsun holidays flying will be carried on at Langdon Hill, when all visitors will be welcome.

A GLIDER EXHIBITION in Scotland.—A temporary exhibition illustrating gliding is now open in the Royal Scottish Museum, Edinburgh. Percy Pilcher's actual glider, a model of Lilienthal's glider, a model of a modern primary glider, and numerous photographs of gliders and sailplanes are exhibited. There is also a section of general aeronautical exhibits which illustrate the most important types of machines, engines and methods of construction.

AN IMPROVED WESSEX

THE Westland Wessex, which has already been described in FLIGHT, has now been fitted with three 7-cylinder Genet engines instead of the older 5-cylinder type.

As one would naturally expect, this has increased the performance considerably, and the take-off is now admirable. There is no difficulty at all in turning either way with one of the wing engines stopped, and she will climb on full load to a ceiling of some 6,000 feet on any two engines.

A further refinement which has recently been added is the wind screening of the pilot's cockpit. This has been to a certain extent re-designed, and the front panels are now divided and made to open as well as the side panels, so that a good view is obtainable whatever the state of the weather.

A recent flight in this machine convinced us of its comfort, especially of its ease to handle with one engine stopped. This is, of course, largely taken care of by means of the Westland-Hill patent rudder bias gear, which gives a new rudder setting for such conditions, but does not put any load upon the rudder bar. Flying with one wing

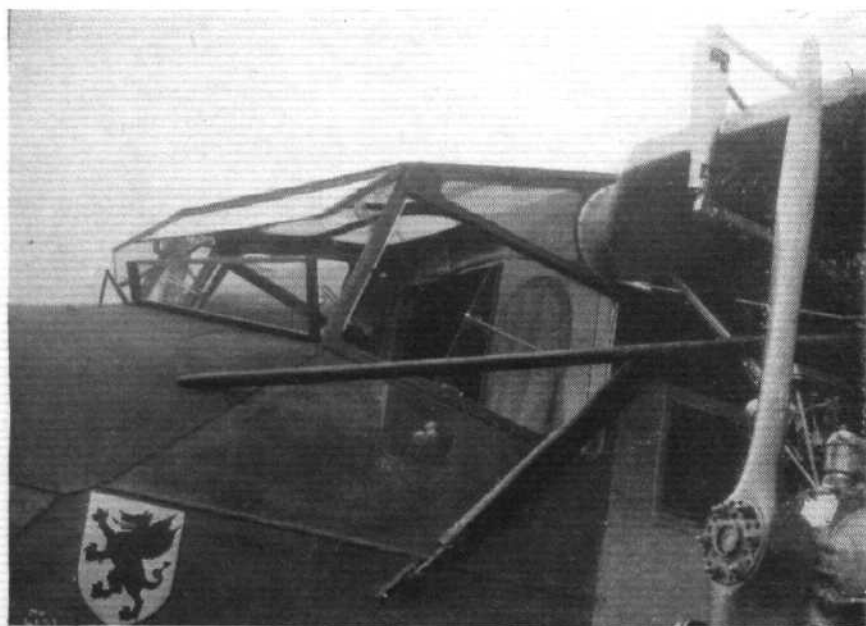
engine stopped, therefore, does not become a tiring matter, such as is the case when the rudder bar is directly loaded.

We have always considered that dual controls should be fitted to every machine with a cabin accommodation such as the Wessex, but no doubt such would greatly increase the cost. The cabin itself is admirably upholstered and the seats comparatively comfortable, although one would like to suggest that a little more padding for the small of the back might tend to relieve fatigue on a long journey. Conversation can be carried on in a reasonable manner, but the fitting of efficient silencers would, of course, make a great deal of difference.

The brakes are particularly efficient, and, when taxiing on the ground, it gives one a great sense of confidence to be able to pull up much in the same way as if one were in a motor-car.

Balanced ailerons are now fitted as standard, making them particularly light and responsive in action.

For those who require a medium size three-engined machine with a good performance, the Wessex, which is a product of Westland Aircraft Works, Yeovil, should suit them admirably.



Excellent visibility is provided in the cockpit of the Westland Wessex, and the front wind screen now opens both in the front and at the side for use in bad weather. The latest model, with three 7-cylinder Genet engines, has a fine performance, and a recent flight in it with one engine stopped was a revelation.

THE ROYAL AERO CLUB OF THE UNITED KINGDOM

OFFICIAL NOTICES TO MEMBERS

REPORT of Meeting of the Committee of the Royal Aero Club held at 3, Clifford Street, London, W.1, on Wednesday, May 13, 1931, at 5 p.m.

Present:—The Right Hon. Sir Philip A. G. D. Sassoon, Bart., P.C., G.B.E., C.M.G., M.P.; Commander James Bird, O.B.E.; Capt. H. S. Broad; Major C. J. W. Darwin, D.S.O.; W. Lindsay Everard, M.P.; Major Alan R. Goodfellow; Capt. A. G. Lamplugh; Colonel F. Lindsay Lloyd, C.M.G., C.B.E.; Air Vice-Marshal C. A. H. Longcroft, C.B., C.M.G., D.S.O., A.F.C.; John Lord; Lieut.-Col. Sir Francis K. McClean, A.F.C.; Lieut.-Col. J. T. C. Moore-Brabazon, M.C.; Lieut.-Col. M. O'Gorman, C.B.; Major H. A. Petre, D.S.O., M.C.; Capt. C. B. Wilson, M.C.; H. E. Perrin, Secretary.

Election of Members.—The following new members were elected:—Robert Lewis Baker, Clifford Huntsman, Flying Officer Kenneth Evelyn Parker, Thomas Walker-Paton, John James Scholes, Oliver Edwin Simmonds, Flying Officer Richard Garnons Williams.

Aviators' Certificates.—The following Aviators' Certificates were granted:—

9788	Joyce K. Grimes	Home Counties Ae. S.
9789	Cicely M. Jackson	Home Counties Ae. S.
9790	Ernest H. Johnson	Home Counties Ae. S.
9791	Roderic O. Roch	Hanworth Club (N.F.S.)
9792	Jans J. Ruben	Henderson Av. Bureau.
9793	Edward A. Rance	London Ae. C.
9794	John O. Sparke	Liverpool & Dist. Ae. C.
9795	Chevalier Jean de Wouters d'Oplinter	Reading Ae. C.
9796	Evelyn B. Longmore	Hampshire Ae. C.
9797	Thomas S. Fisher	London Ae. C.
9798	Geoffrey L. Billson	Liverpool & Dist. Ae. C.
9799	Axel V. S. Lange	Cinque Ports Fl. C.
9800	Karli Magersuppe	Derby & Dist. Ae. C.
9801	Robert L. Neale	Surrey Fl. Services.
9802	Dulcibella Atkey	Airwork Fl. School.
9803	George Baillie	Airwork Fl. School.
9804	Chen-Chia Dee	Cinque Ports Fl. C.
9805	Hubert H. L. Ellison	Leicestershire Ae. C.
9806	Charles F. Cockburn	Reading Ae. C.
9807	Robert Rendle	Surrey Fl. Services.
9808	Thomas C. B. Wilson	Reading Ae. C.
9809	George B. Watson	Rollason Av. Co.
9810	John K. Flower	Northamptonshire Ae.C.
9811	Cyril A. Penberthy.. ..	London Ae. C.
9812	Claud E. C. Penny	British Air Transport.
9813	Philip J. B. Perkins	Hampshire Ae. C.
9814	Peter V. James	Hampshire Ae. C.
9815	Lionel T. Kirby	Bristol & Wessex Ae. C.
9816	William E. S. Tanner	Hampshire Ae. C.

Gliding Certificates.—The following Gliding Certificates were granted:—

135	James K. Watson (A) ..	Ilkley & Dist. Gl. C.
136	Norman C. Hodgson (A) ..	Ilkley & Dist. Gl. C.
137	Arthur Senior (A) ..	Yorkshire Ae. C.
138	Gerald V. Williamson (A) ..	Yorkshire Ae. C.
139	John D. Irving (A)..	Newcastle Ae. C.
140	Rowland H. Bound (A) ..	Hampshire Ae. C.
141	Felix G. Whitnall (A) ..	Channel Gl. C.
142	Richard F. T. Granger (A)..	Nottingham Gl. C.
143	John H. Payne (A) ..	Imperial College Gl. C.
144	George Konried (A) ..	Imperial College Gl. C.
145	Clifford H. Jackson (A) ..	Imperial College Gl. C.
146	Paul Adorjan (A) ..	Imperial College Gl. C.
147	John B. E. Keeble (A) ..	Imperial College Gl. C.
148	James E. W. Cheney (A) ..	Channel Gl. C.
149	Bernard Hartley (A) ..	Ilkley & Dist. Gl. C.
150	John H. Allen (A) ..	Ilkley & Dist. Gl. C.
151	Stephen E. Brown (A) ..	Ilkley & Dist. Gl. C.
152	William H. Jacques (A) ..	North Cotswold Gl. C.
153	Stewart Scott-Hall (A) ..	London Gl. C.
154	Herbert G. Hall (A) ..	London Gl. C.
155	Eugene Brame (A) ..	Surrey Gl. C.
1	C. H. Lowe-Wylde (C) ..	Kent Gl. C.
29	Alan H. Reffell (C) ..	Surrey Gl. C.
38	Montgomery H. Thomson (B)	Surrey Gl. C.
66	Horace C. Wright (B) ..	North Cotswold Gl. C.
67	Douglas E. Culver (B) ..	London Gl. C.
123	M. H. Findlay (B) ..	Hanworth C.
127	S. M. Thompson (B) ..	Leeds Gl. C.

F.A.I. Conference, Bucharest.—The Committee considered the Agenda of the F.A.I. Conference, to be held at Bucharest on June 6-12, 1931. The questions for consideration included the third party liability of air tourists in foreign countries, regulations for gliding records, the simplification of the Carnet for air touring and the European International Touring Competition, 1932. Lieut.-Col. M. O'Gorman and Major C. J. W. Darwin were appointed delegates to represent the Royal Aero Club.

King's Cup Air Race.—Competitors are reminded of the special regulations governing this year's race. The aircraft must have been registered in the name of the entrant not later than May 30, 1931. Also all Certificates of Airworthiness must have been issued by that date. The closing date of entries is June 22, 1931. Late entries (double fee), July 1, 1931. Full particulars may be obtained from the Royal Aero Club, 3, Clifford Street, London, W.1.

The Late Mr. G. B. Cockburn.—Major J. P. C. Cooper has presented to the Royal Aero Club a framed portrait of the late Mr. G. B. Cockburn.

Offices: THE ROYAL AERO CLUB,
3, CLIFFORD STREET, LONDON, W.1.
H. E. PERRIN, Secretary.

Overhead Cables and Aircraft

In connection with the questions asked in the House of Commons on the 6th instant concerning the danger to aircraft from overhead high tension cables, it is of interest that the Civil Aviation Section of the London Chamber of Commerce has had this subject under review, and has submitted the following suggestions for the consideration of the Air Ministry: (a) That information as to the erection of new high tension cables should be circulated through the usual Air Ministry channels. (b) That their position should be marked on $\frac{1}{4}$ -in. ordnance survey maps (Civil Air Editions). (c) That they should be marked at night and during conditions of poor visibility. The Section feels that adequate notice should be given to air-men of the erection of these cables and that if their

position were marked on air maps the attention of pilots would be drawn to them at the most appropriate time.

A Speed Ball

On Tuesday, June 9, a "Speed" Ball will be held at the Dorchester Hotel, Park Lane, in aid of the R.A.F. Memorial Fund and the Air League Scholarship and Education Fund. A Cabaret has been arranged by Mr. Leslie Henson, and the Embassy Band will provide the music. The Ball will be under the patronage of their Royal Highnesses the Duke and Duchess of York, while the Duke of Sutherland will be the President. Tickets, inclusive of champagne supper and buffet, price £2 2s. each, can be obtained from the Air League, Astor House, Aldwych, or from the organiser, Mrs. Arthur Croxton, 28, Mount Street, Park Lane.

Airisms from the Four Winds

The Prince Inspects Aerial Beacons

THE Prince of Wales, on May 11, paid a midnight visit to the works of Chance Brothers & Co., Ltd., of Smethwick, Birmingham, to see high-power floodlights in use under working conditions. Two lamps were laid out for his inspection in the firm's recreation ground. One, a million candle-power, is to be used at Lympne Aerodrome, Kent, and the other was a smaller floodlight for Tanganyika, East Africa, and similar to others which are to be installed on the air route to India.

Captain Ahrenberg

THE most popular man in Sweden just now probably is Captain J. G. Albin Ahrenberg, the great Swedish pioneer aviator, who has just been presented with the Gold Medal of the Swedish Aero Club for his flight to discover Mr. Augustine Courtauld, the young British millionaire explorer, marooned in the ice deserts of Greenland. Ahrenberg is one of the earliest pilots, and undoubtedly the most experienced and skilful in Sweden. He began his career as a military flyer, was a specialist in test flights of new machines and also an excellent instructor. For the last seven years he has been in the service of the Swedish Aerotransport Company, and in 1926 he was appointed head of the Stockholm Flying Station. Last year he attempted a flight to America via Greenland in order to establish the possibility of a regular commercial flying service between Scandinavia and the United States, but was held up at Ivigtut, in Greenland, owing to unfavourable weather conditions, and ultimately had to abandon his plan for the time being. He is a typical sturdy Swede, prudent and fearless, and practically without any nerves. Of late years he has made himself mostly known as a national propaganda flyer, in which capacity he has visited with his machine practically every nook and corner of Sweden, carrying out passenger flights everywhere, and has done more than any other Swede to popularise flying in his own country. Ahrenberg has flown a total distance of nearly 500,000 miles and carried, in all, about 38,000 passengers, the last-mentioned figure probably being a world's record. He has also acted as chief pilot of the Continental flying lines of the Aerotransport Company, and has thus largely contributed to build up the almost unparalleled reputation of that company for safety and accuracy of service. Capt. Ahrenberg flew from Augmagsalik to Reykjavik on May 17 on his way back to Sweden from Greenland.

Tommy Rose Continues

WE are glad to learn that the forced landing made by Fl.-Lt. Tommy Rose near Luxor, during his speedy flight home from Cape Town, was not so serious as some reports made out. According to a cable sent to the Cirrus-Hermes Engineering Co., Ltd., he flew blind for half an hour in a sandstorm, and when he landed he found the cowl full of sand and the rear rockers seized. He remedied the trouble, and is proceeding home by easy stages—at the time of writing he is held up at Benghazi.

Mrs. Montagu Proceeds

THE Hon. Mrs. Edwin Montagu, who crashed on May 2 near Meshed (Persia) during her tour of Russia and Persia, has obtained a new—or rather a second-hand—mount with which to continue her tour. She purchased a "Moth" in Iraq, and left for Astrabad, on the Russian frontier, on May 16.

Hawks' High-speed Hops

CAPT. FRANK HAWKS, who flew in his Travelair "Texaco 13" from London to Berlin in 2 hr. 57 min. last week, carried on from Berlin to Hamburg (about 160 miles) in 58 min., on May 13, and then, next day, on to



CAPT. AHRENBURG: Our illustration shows Capt. J. Ahrenberg (on float) and his wireless operator, Ljunglund, just before setting out from Malmo for Greenland in the Junkers seaplane to take part in the rescue of Mr. Courtauld. Shell spirit and oil were used for this flight, which rendered material assistance in the rescue work.

Malmslaett Aerodrome, Sweden (over 400 miles), in 1 hr. 53 min. He next flew over to Stockholm, as noted in our report of the Aero Show there on p. 448.

No. 203 (F.B.) Sqd. R.A.F.

THREE "Southampton" flying boats, of No. 203 (F.B.) Squadron, which have been replaced by "Rangoons," left Basra for England on April 28. Flying by way of Syria, Egypt, Athens, Italy, and France, they reached Plymouth on May 14, and, after refuelling, left for Calshot. Sq.-Ldr. P. H. Mackworth was in command.

Dr. Dornier shows his Appreciation

As a mark of gratitude for the hospitality shown him, and the assistance given to him during his visit in the Do.X to Calshot in November last, Dr. Dornier has presented to Grp. Capt. Nanson and the officers of the R.A.F. Base at Calshot an extremely nice silver cigarette box.

He has also sent a fine tankard, which is a copy of one of the Charles II period, to the airmen at the Base for competition. Both the box and the tankard are suitably inscribed.

Minor Mishaps

MR. NORMAN BLACKBURN and Mr. Fulford, while flying from London to Berlin in a "Bluebird" on May 15, had to make a forced landing after leaving Hanover. Owing to the marshy nature of the ground, the machine went over on its nose, fortunately without very serious results. On May 17, Miss Leathart, who is making a flying tour round Europe in her Westland "Widgeon," had to make a forced landing at Bad Reichenhall. The machine crashed, and while she was unhurt, her passenger, a German, received minor injuries.

An East-West African Flight

A FLIGHT across Central Africa was accomplished recently by Mr. C. P. Mosters, of Wilson Airways, in a "Puss Moth" he was flying to England. He flew from Zanzibar to Nairobi, where Mrs. Wilson joined him as passenger, and they then flew to Gao, on the Niger, and on to Bathurst (Gambia), whence they followed the West Coast northwards. They touched at Las Palmas and Madrid on the way to England. Mr. Mosters has since returned to Nairobi, along the more usual route through Egypt.

A Little Knowledge

THE danger of writers rushing into technicalities without first gaining adequate information on their subject is



Grp. Capt. R. C. M. Pink greeting General Gillieaux on his arrival with a squadron of the Belgian Army Air Corps at Manston.

emphasised by the publicity which has recently been given to parachutes in a daily paper whose circulation is claimed to be away up into the seven-figure mark.

The correspondent in question described the tests he witnessed of a parachute, and on the strength of these he claims that the parachutes used by the Air Ministry are obsolete and not safe when used at an altitude of less than 800 to 1,000 ft. He even goes on to attribute many of the deaths in the R.A.F. to the use of these so-called "obsolete" parachutes, and suggests that "something should be done about it." His lamentable lack of knowledge about parachutes is obvious from the following paragraph. He says:—"Owing to the fact that there is no pilot parachute to drag out the main body, no skill is required." Such remarks are merely laughable to anyone who knows anything of the operation of parachutes, and make the article of less than no value, but its treatment in a paper with such a circulation cannot but create distrust among the public in general.

No doubt this writer has been misled by an over-zealous salesman of the type of parachute he advocates, but "get your facts right" is the first lesson in journalism, and in this case it does not seem to have been learnt. Actually, of course, the parachute used as standard in the R.A.F. was not accepted without very careful and extended trials by persons well qualified, and if any other make could substantiate claims to have such a vastly better performance, there is no possibility of doubt that it would replace the one now in use.

Friends and relatives, therefore, of R.A.F. officers and men need have no qualms or feel that an immediate change of parachute is necessary, or that their lives are being unduly endangered when they have to "take to the silk."



The Belgian Army Air Corps Squadron at Manston. The machines are Breguet XIX's reconnaissance aircraft and are built in Belgium. The Squadron arrived on May 5 and spent the rest of the week visiting other R.A.F. stations.

Over the Andes on an Avro

AN Avro Trainer, fitted with an Armstrong Siddeley Lynx engine, flown by Captain Norman Macmillan, recently made a successful flight across the Andes Range. The flight started from Buenos Aires and continued to Puerto Belgrano (350 miles), Neuquen (330 miles) and Chillan (295 miles), this stage including one crossing of the Andes. From Chillan to Santiago (120 miles) the course ran in a northerly direction, and conditions were comparatively easy; but the next stage, from Santiago to Mendoza (120 miles), included a passage of the Andes with Aconagua (22,868 feet) in close proximity to the course. The flight from Mendoza completed the round trip of just over 1,800 miles, during which Captain Macmillan states the Avro Trainer and Lynx engine performed magnificently.

Capt. Finch-Hatton Killed

CAPTAIN THE HON. DENYS FINCH-HATTON—who organised the Prince of Wales' hunting trip to East Africa—and a native servant were burned to death near Voi, Kenya, on May 14, when his "Moth," in which they were making a flight to Nairobi, overturned when taking-off and caught fire.

An Aerodrome for Bombay

ACCORDING to *The Times* Bombay Correspondent, improvements estimated to cost £105,000 have been undertaken by the Government in order to make an aerodrome at Juhu, near Bombay, to be used all the year round. This involves raising the level in the centre by 3 ft., and it is expected that half the necessary earth-work will be completed before the end of this year.

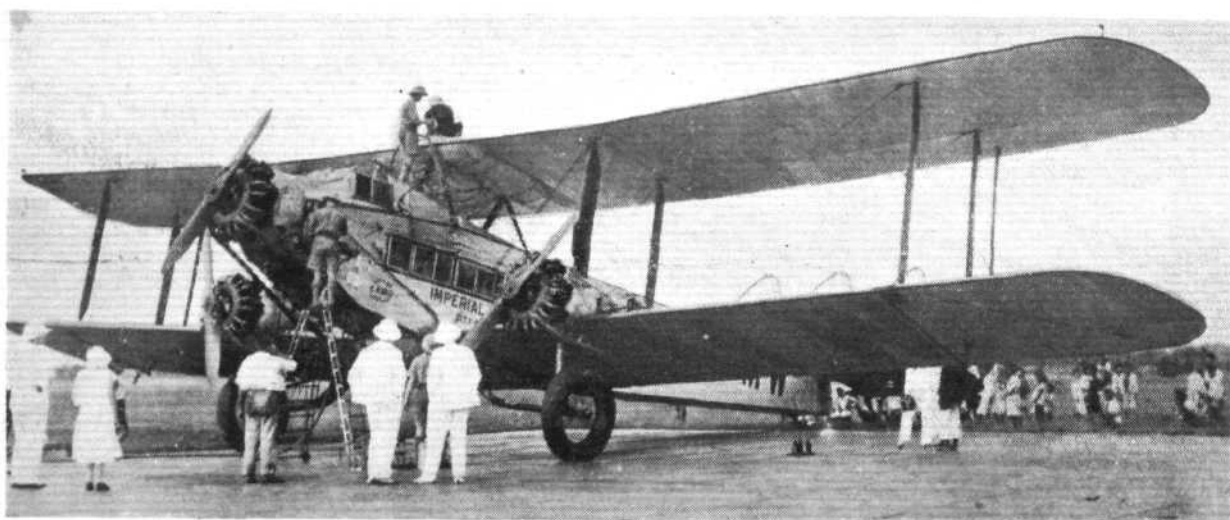
Aeroplane-Carrying Mail Steamers

Two mail and passenger ships of 14,000 tons, each equipped with an aeroplane landing stage, are among the vessels now under construction in Spain, according to the report just issued by the Spanish Naval Construction Board. The aeroplanes carried by these ships, which include all the latest devices for the comfort and safety of passengers, will be used to facilitate the movement of the mails.

Diesel Engine Lubrication

Now that the Junkers Diesel has flown, the subject of lubrication of high-speed C.I. engines will be a matter of the moment to aircraft designers. Among those who have realised the importance of this matter are W. B. Dick & Co., of 26, Grosvenor Gardens, S.W.1, the makers of "Ilo" lubricating oils. They have recently issued two very interesting little pamphlets, named "Fuel Injection and Lubrication" and "The Diesel Engine and Modern Transport," both of which are written by the well-known authority, Mr. H. H. R. Drossi. The first deals entirely with the subject of lubrication in C.I. engines, and in this respect it is worth noting that W. B. Dick & Co. probably supply more oil for Diesel engine lubrication than any other firm in the world. The second pamphlet gives details of the A.E.C. and Gardner high-speed oil engines, both of which are now in use on the road, fitted to commercial vehicles. A particularly interesting comparison of the working cost and efficiency is found in the latter pamphlet.

Air Transport



THE FIRST AIR MAIL TO AUSTRALIA: The ill-fated DH "Hercules" *City of Cairo*, of Imperial Airways, with the mail for Australia, refuelling at Batavia. The machine, it will be remembered, crashed at Kupang shortly after.

The Australia Air Mail

THE first through air mail from Australia, which arrived at Croydon on May 14 (not, as stated in error last week, on May 12), consisted of about 20,000 letters. The mail, which left Sydney on April 24, took 20 days—a saving of 14 days over ordinary transport—and was flown all along the route according to schedule. The second outward mail, which left Croydon on April 25, arrived at Sydney (in charge of Air Commodore Kingsford Smith) on May 14. The Dutch air mail, which left Batavia on May 12, reached Sydney on May 18.

England-India via Italy

SIR RONALD GRAHAM, the British Ambassador to the Quirinal, and General Balbo, the Italian Air Minister, signed the new Air Convention between Great Britain and Italy on May 16. Imperial Airways will, we understand, resume the service to India and Africa over Italy immediately. This, together with night flying over the Baghdad-Basra section, and the introduction of the new "Kent" flying boats, will provide a considerable speeding-up of these services.

The Puss Moth on the Air Mail in Canada

DURING the months of November and December last, Canadian Airways operated a Puss Moth on loan from the de Havilland Company for the purpose of trying out its suitability on air mail work, it being thought that, when the volume of mail is small (that is to say, not more than 500 lb.) and no passengers are carried, the use of a Puss Moth, with its low operating costs and good performance, would enable great economy to be effected. During the period, the Puss Moth was flown over all the regular Eastern lines operated by the service, and was flown by all the company's pilots. We quote some of the outstanding runs—

Run.	Pilot.	Company's Official Mileage.	Time of Flight.
			hr. min.
Wayne County (Detroit)—Windsor—Hamilton—Toronto	J. A. Yonge ..	237	2 20
Montreal—Quebec	W. H. Irvine ..	134	1 15
Montreal—Brownville—Moncton	Bernard Martin	467	3 20
Montreal—St. John—Moncton ..	H. C. W. Smith	467	3 55
Toronto—Montreal	E. C. Burton ..	328	2 30

When the Puss Moth was returned to Toronto on completion of a very severe trial under the rigid winter mail operating conditions, the de Havilland Company was very pleased to find the following unsolicited tribute to the Puss Moth entered in the log book:—"Returned to the de Havilland Company at Toronto, 22/12/'30. Note.—All pilots speak very highly of the performance of this aircraft

for air mail flying, and are very enthusiastic regarding the comfort. (Signed) A. F. Ingram, Operating Manager, Air Mail Division, Canadian Airways, Ltd."

Catapult Air Mails

THE ship-to-shore air mail service from the North German Lloyd liners *Bremen* and *Europa* was inaugurated on May 18, when a monoplane catapulted from the former liner 250 miles west of Land's End, landed at Southampton.

West to East Atlantic Mail Flight Project

News received in Dublin from New York states that Col. J. C. Fitzmaurice, who flew with the late Baron von Huenefeld and Captain Kohl from Baldonnel to Greenly Island, off the coast of Labrador, in the Junkers monoplane "Bremen" in 1928, intends to attempt a West to East flight across the Atlantic from Newfoundland to Ireland in a Sikorsky twin-engined amphibian with a payload of about 500 lb., consisting of mail. The flight is due to commence about June 16, and Col. Fitzmaurice will be accompanied by a former U.S. Navy officer as navigator and wireless operator.

A New Air Mail Leaflet

THE Postmaster-General announces that the Spring edition of the Air Mail leaflet, which gives particulars of the Summer air mail services available for correspondence posted in this country, has now been issued. Copies of the new leaflet are being sent to regular users of the service, and can also be obtained free of charge at any Post Office. Regular users of the air mail services are advised to consult the new leaflet as a number of changes have been made. Night air services to Belgium and Germany, and to Austria, Denmark, Hungary, Norway and Poland via Berlin are again available, and there is a new night service to Switzerland for which the latest time of posting at the General Post Office, London, is 7.0 p.m. on weekdays, except Saturdays. Correspondence sent by the latter service should be delivered in Bâle and Zurich about noon on the day after posting. The combined postage and air fee to all European countries to which an air mail service is advertised is 4d. for the first ounce and 3d. for each additional ounce. Special attention is also drawn to the new Canadian internal air mail service, in connection with the ships of the Canadian Pacific Railway Company, which offers acceleration to most of the principal cities at the low charge (including postage) of 2½d. the first ½ oz., and 1½d. for subsequent ½ ozs. Under the Summer time-tables of the England-India and England British East Africa air services, for which the latest time of posting remains at 6.0 a.m. on Saturdays in the special air mail posting box outside the General Post Office, London, the mails will be due to reach Karachi in 5½ days, Delhi in 6 days, Kisumu (Kenya) in 6½ days, and Mwanza (Tanganyika) in 7 days.

Airport News

MUNICIPAL AERODROMES

ALAN COBHAM AVIATION, LTD., has probably done more in influencing cities and towns in England to embark on the establishment of municipal aerodromes than any other concern, and it is a matter of interest to see exactly the position of things at the present time.

Airports have been established at Blackpool, Hull, Nottingham and Stoke-on-Trent, and these are now being operated by N.F.S.

Bristol, Ipswich, Liverpool, Manchester, Plymouth and Portsmouth are other towns which have gone ahead upon their own.

Carlisle, Sheffield, Leicester and Southampton have purchased sites which are now awaiting development. A further 18 towns are negotiating for the purchase of sites, including Birmingham; Cardiff, where the clearing of the site is now in progress; Cheltenham and Gloucester, who are as yet undecided as to the advisability of a joint site; Doncaster; Leeds, which is considering the establishment of a joint aerodrome with Bradford, at Yeadon; Walsall and Worcester.

Complete surveys of the environs of most of the towns already mentioned have been made, and in addition also those of Aldershot, Aylesbury, Abergavenny, Barnsley, Barnet, Bath, Bexhill-on-Sea, Bridlington, Brighton, Burnley, Bournemouth, Burton-on-Trent, Eastbourne, Grimsby, Great Yarmouth, Hastings, Harrogate, Halifax, Hereford, Huntington, Lincoln, Motherwell, Newcastle-on-Tyne, Newport (Mon.), Rotherham, St. Albans, Skegness, Southport, Stirling, Stratford-on-Avon and Taunton.

One of the difficulties to be faced in the matter is that of acquisition of the land, and many of the above may have to make use of the Public Works Facilities Act, 1930, which gives them compulsory powers for the purpose of constructing an aerodrome.

Overhead high-tension electric cables are also causing obstruction in many places which might otherwise be suitable, and in some cases the cables have been run over sites while negotiations were in progress. This is regrettable, but only to be expected, since the majority of the

authorities concerned take so long to make up their minds whether they require an aerodrome or not, that, naturally, the Electricity Commissioners cannot be expected to wait indefinitely.

Brighton is establishing, together with Hove and Worthing, a joint aerodrome at Lees Barn on the Old Shoreham Aerodrome site. This has excellent facilities, and good communications with all three towns.

Bournemouth is another town which is in danger of losing a good site while debating upon matters connected with it.

Newcastle is finding difficulty in settling upon their site owing to the cost of the land.

Newport (Mon.) has a good site close to Tredegar Park, but it seems possible that Lord Tredegar, who is adverse to aircraft flying over his property, may use his power to prevent its establishment.

One of the most difficult parts of Sir Alan's undertaking has been to make the authorities realise the true position of aviation. Many of them either think that there is an immediate fortune to be had out of the establishment of an aerodrome, or else they look upon aviation as something fantastic and quite impractical, and certainly not a thing upon which public money should be spent. Borough surveyors and city engineers also often consider themselves perfectly capable of finding a suitable site, and quite overlook the enormous volume of work which is really necessary to find the best site as opposed to just a *good* site.

Sir Alan has also worked out a complete scheme for the planning of London's future airports, and he considers the matter extremely urgent. He has been in touch with the London County Council, the Metropolitan Boroughs Joint Standing Committee, the London Chamber of Commerce and the Port of London Authority, but so far has been unable to get anyone to take the responsibility for sponsoring a complete search, nor has he succeeded in getting them to pool their interests. There is no doubt that the matter is urgent, and that available sites situated near the centre of London should be reserved for development, and the river accommodation planned.

CROYDON

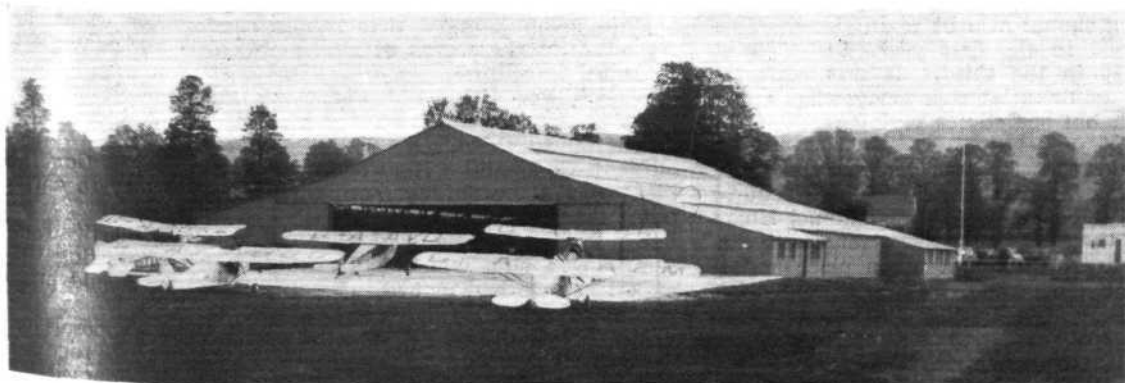
THIS week, the aerodrome has had the appearance of a miniature Hollywood, and for several days various film companies have been busy "shooting" scenes for films. The two films on which they are working are "The Flying Fool," by the British International Pictures, and "Deadlock," by Nettlefold Film Studios. The number of times that a scene has to be gone over makes me thankful that I am not a film star.

On Monday, Captain Hawks surprised us by arriving

from Paris; we all thought he had paid us his farewell visit.

On Tuesday, he set out to break the London-Berlin record, and his effort is now well known. His time was 2 hr. 57 min., a wonderful performance. His skill as a navigator is astonishing; even with such a fast machine, he could not have deviated from his course for a second to do the trip in the time he did.

British Air Transport, Ltd., late Henderson Aviation



AIRWORK ENTERPRISE: The new Service hangar at Bristol which Alderman Sennington formally handed over to Mr. Nigel Norman on Friday, May 15, is on the same lines as their familiar buildings at Heston, only somewhat larger, and has been built by John Lysaght of Bristol. On the right is Mr. Norman with Alderman Sennington (with glasses). Full Airwork Service will now be available for all private owners and others requiring it in the "West Country."

Bureau, are opening a new branch in South Africa under the management of Captain Douglas Mail. It will be remembered that Captain Mail had the misfortune to crash an Argosy a month back, while taking his "ticket" on a three-engined machine. The machine for the African branch of the company is expected to leave shortly, and will be flown out by Captain Mail.

Imperial Airways have acquired an Avro X, and it is understood that it will be used on the Paris-Zurich section of the London-Zurich service.

On Friday, all the Imperial Airways' pilots did their landings on this machine, but when it was inspected during nightly overhaul, it was found that one of the undercarriage fittings had fractured, so the Avro X is out of service for a short time. Further misfortune befel them on Saturday, when the starboard undercarriage of a Handley-Page W.10 collapsed while taxiing out with a load of joyriders. Luckily, only slight damage was done, and this machine will not be in the hangars very long.

The first Australian Air Mail arrived this week, amid scenes of great rejoicing. Naturally, the Press formed a large section of the crowd, who came to see the arrival.

The Royal Dutch Airlines have commenced their annual strawberry-carrying season, and every evening their

machines are packed to capacity with boxes of this delicious fruit. From Croydon they are sent to various fruit markets, all over the country.

The tarmac is at last beginning to look respectable again, and it is to be hoped that we shall not be subjected to dust storms, as during previous seasons. The only redeeming factor has been the Aerodrome Hotel, and it has been possible to wash the dust down at various times, but, unfortunately, that becomes an expensive pastime. Some think it is better to go farther afield to another well-known local hostelry, where prices are lower!

Two flights of Bristol Bulldogs have passed through here during the week, *en route* for Sweden. These represent part of an order to equip the Swedish Air Force with these machines. Both flights were piloted by Swedish officers, whose uniform is more naval looking than military.

The regular services have been fully maintained, in spite of the weather, and the Aerodrome has had its full share of visits from private owners.

Joyriding has been as popular as could be expected, and, when the weather gets really good, this part of the business should flourish.

The traffic figures for the week were:—Passengers, 912; freight, 59 tons. P. B.

OUR AIRSHIP POLICY

THE Prime Minister made a statement in the House of Commons on May 14 about the future of airship policy. He said that after reading the Simon report on the loss of R101, the position was that airships up to date had neither proved a failure nor achieved an assured success. The cost of the 1924 programme, including the two ships, masts, etc., had been £2,350,000. The United States was pursuing a policy on similar lines to ours. Germany was doing the same. We could do one of three things. We could set up the 1924-30 programme and continue to build new ships and go on; we could scrap everything, or we could take a middle course and reduce our airship equipment to proportions and to an organisation which would, for the time being, be more in the nature of a scientific investigation than of anything beyond that. The Cabinet had decided upon the middle course. There would be no new construction. Cardington would be kept as a nucleus. The overseas bases, for which we were responsible, would be maintained so that they should not fall into disrepair. They hoped that the Ismailia and Karachi bases would be kept, and they had asked the Canadian Government its views about Montreal, but had had no reply. There would be no spectacular flights by R100. No new bay would be inserted in the ship. She would just be put back into flyable condition. She would become an experimental ship. The Aeronautical Research Committee had a very keen interest in carrying on the experiments which it had begun, and which had been carried to a very interesting point. Model experiments required to be tested by something on a much larger scale. There was another consideration. Supposing airships were not going to be a complete failure, and during the next few years we felt that we must go back to some active interest in airships, it would be a tremendous mistake if in the meantime we had been training no men for airship construction. A nucleus in flying training should also be maintained. This plan would cost £120,000 in the first year, £130,000 in the second and £140,000 in the third. It was perfectly true that in these days of financial stringency what could be saved must be saved, but sometimes saving was a form of very short-sighted extravagance.

Sir Samuel Hoare said that he was inclined to agree with the Prime Minister's argument that the right course was a middle course. The Simon report, Sir Samuel Hoare said, did not show that there was anything wrong with airships as such. If the disaster had not taken place and if it had been possible to have had a year's trial with R101, he believed that it would have been possible to reduce some of the almost excessive safety factors and to have got the weight considerably lower than it was at the time of the disaster. With regard to personal pressure to undertake the flight, he said that he should probably have done very much what Lord Thomson did. He recalled that during the five years of preparation almost every member of the House and almost every member of the public was constantly demanding quick

results. He had had to defend the line, the wise line, of giving a free hand to the technicians and the scientists and not to tempt them into producing quick and spectacular results before they were ready. We could not scrap all the research work of the last five years. He supported the Prime Minister's proposals.

Sir John Simon pointed out that the programme had provided that if one ship failed there should be another to carry on the experiment. He took the view that the course the Prime Minister recommended was the right one. He did not think it proved that travel by airship had an assured future, but that the disaster did not disprove the case for airships. He mentioned three difficulties which lay before airships, first, to get enough lift. He did not believe that so much real scientific planning and plotting had been applied to any structure in the history of the world as was applied to R101. But she had not enough lift. The second, was to give enough speed to overcome adverse winds. He said that a speed of about 100 or 120 m.p.h. was desirable. He mentioned the impossibility at present of making quite correct weather forecasts. The third difficulty was the unwieldiness of a very large airship for mooring and handling. He explained that an increase of size improved the proportion of lift, and, therefore, there was always a tendency to go for larger ships. He also advocated that the Air Council should include a man whose principal qualification was very high scientific attainment in the branches of science specially concerned with airships. We should, he said, regard airship transport as an international problem, as an attempt by civilised mankind to make more use of the brains and courage of men and of the character of the world. We could not expect America and Germany and other countries to afford us the full advantage of their progress if we did not do something ourselves. We should use R100 on experimental flights.

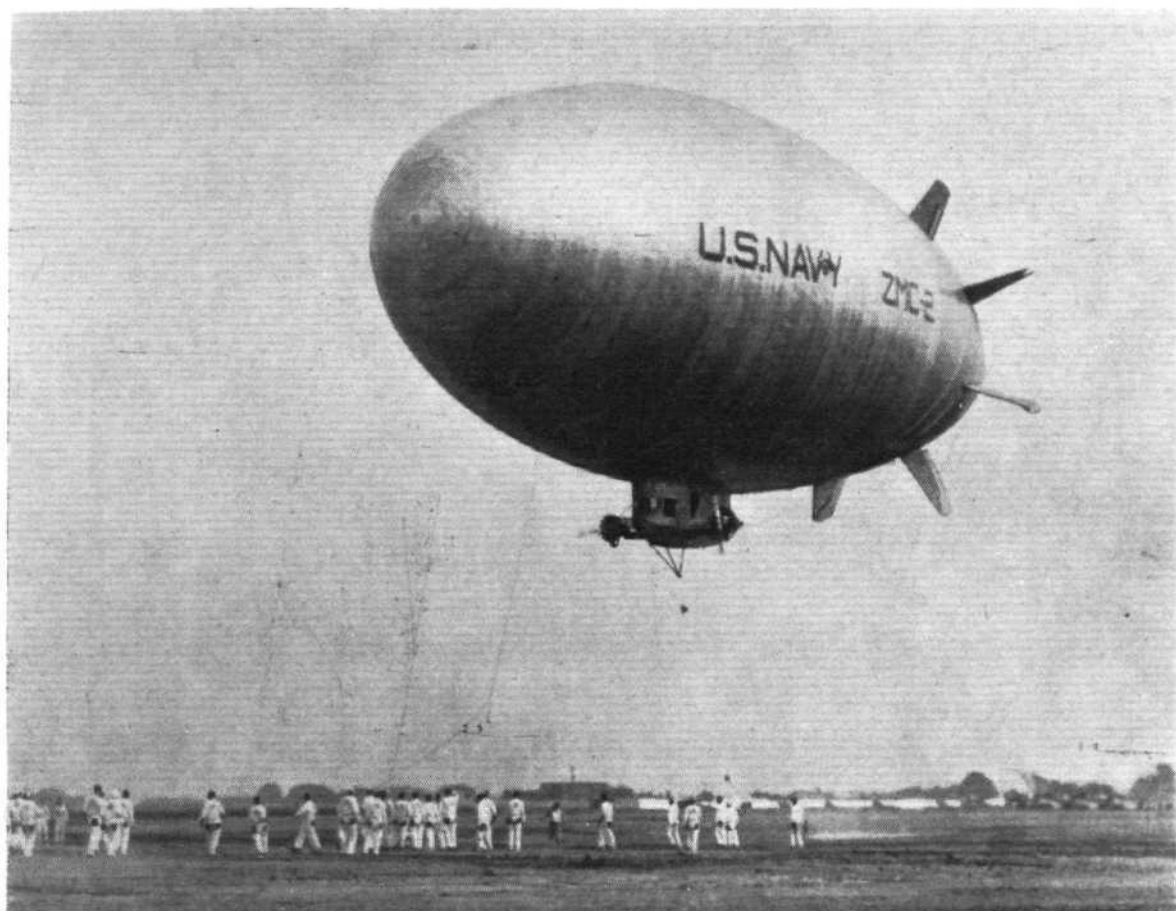
Major Church urged that airship construction should be regarded, in the words of Professor Southwell, as a great technical adventure.

Sir William Brass did not think the Government was right in carrying on with the airship. He would like to sell R100 to the United States, where they had helium.

Lieut.-Commander Kenworthy was glad that the Government was not spending more than was necessary to carry out scientific experiments.

Sir Philip Sassoon said that we were not justified in scrapping a ship which had cost so much or wasting the experience we had gained. He urged that we should push on with developing flying boats.

Mr. Mander and Mr. Malone opposed the proposals of the Prime Minister. Mr. Wells supported the proposal. Mr. Hardie and Commander Locker-Lampson opposed it. Admiral Murray Sueter spoke of the use of airships as naval scouts. Mr. Montague, Under-Secretary for Air, wound up the debate, saying that R100 would probably continue to use hydrogen, which had given very good results on many airship voyages.



The ZM C. 2 coming to land.

THE METALCLAD AIRSHIP

By CARL B. FRITSCHÉ

President, Aircraft Development Corporation, Detroit, Michigan, U.S.A.

*Lecture (abridged) delivered before the R.Ae.S. on Thursday,
May 14, 1931*

AFTER an historical introduction, in which Mr. Fritsche paid tribute to all the pioneer engineers and to those who have lost their lives in the cause of airships, he continued:—In 1921 a group of men in Detroit, identified principally with the automotive industry, organised an experimental airship engineering group, headed by Ralph H. Upson and myself. Their purpose was to modernise the rigid airship and make it all metal like the hull of a sea-going vessel.

The first endeavour of this group was to isolate and to determine the scientific fundamentals governing the design of an all-metal structure in airships. The General Motors Corporation, the Ford Motor Company, and other industrial concerns very generously contributed valuable laboratory facilities; the Aluminium Company of America undertook to develop aluminium alloy in thin sheets; aeronautical engineers and metallurgists in Washington were invited to offer criticisms and suggestions.

Hypothetical metal ships of different sizes were designed in considerable detail, and a thorough stress analysis involving even the integration of all forces as applied to each square foot of the hull surface was worked out carefully. No experimental effort was spared through actual physical test to verify the theory of design, of the main bending and shearing action and of the safety factors involved. So gradually through years of patient and systematic effort the general theory of the metalclad airship was mathematically and experimentally proved.

Fundamental Design Varies from Zeppelin Practice

For ten years this engineering research and investigation has been carried on. The trial and error methods disclosed that, while the Zeppelin development is extremely valuable from the standpoint of the definition of technical problems, the methods of solution are in most cases different. This is due to the fact that the entire theory

of the accommodation of stresses in the metalclad ship is different from Zeppelin practice. In the metalclad ship the shear stresses, and to a large extent the tensile stresses, are carried in the metal covering, the plating of which also very definitely reinforces the internal frame members, thus reducing their design weight requirements. In the Zeppelin the shear stresses are carried through a complex system of diagonal wiring in the planes of the ship's surface.

The surface of the conventional fabric ship consists of five layers (exclusive of framing), from outside to inside, namely:—Outer fabric covered with doped coating; shear wiring; gas-pressure wiring; cord netting (eliminated in the latest Zeppelin); gas cell fabric lined with goldbeater skin.

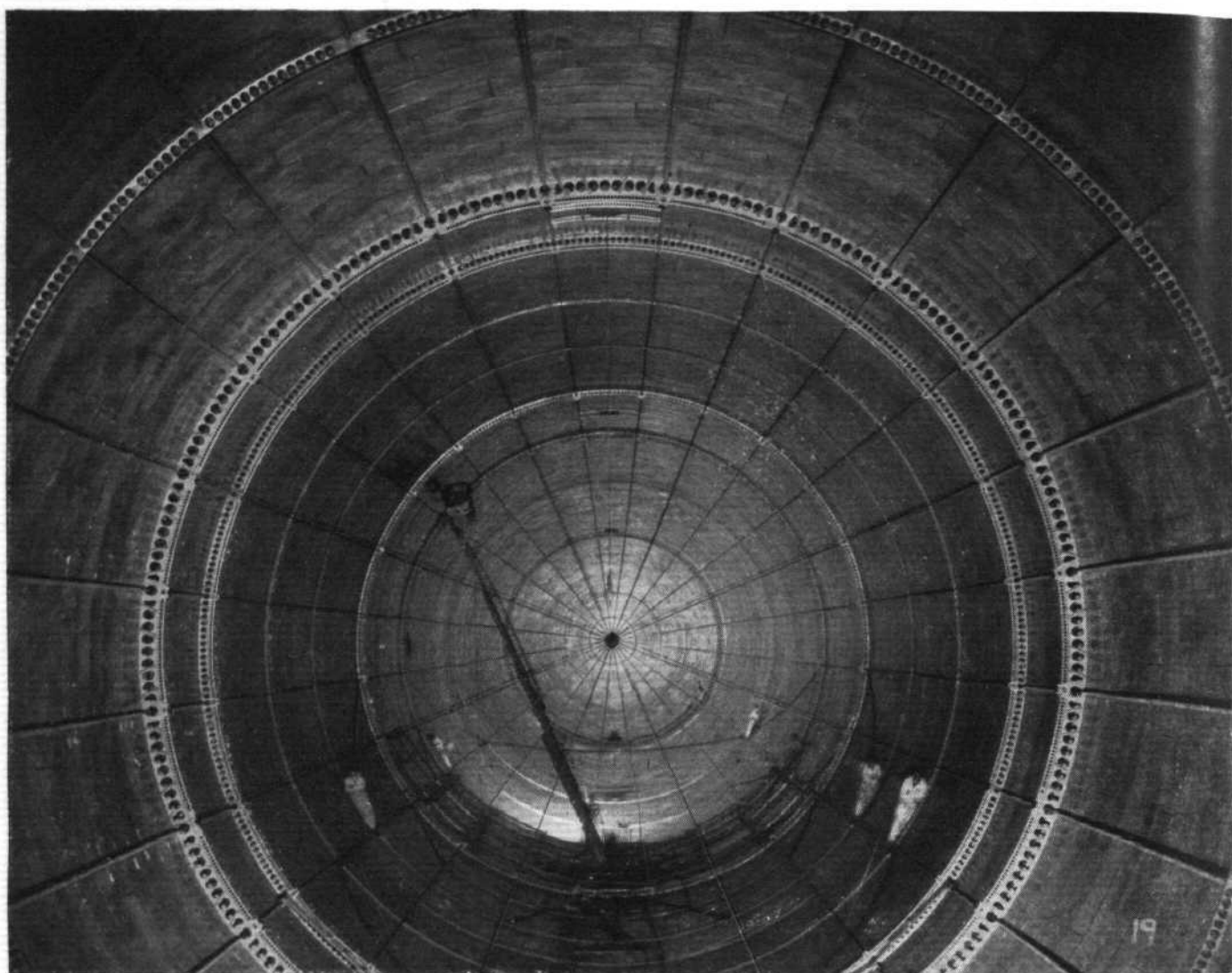
These five layers in the fabric-covered airship collectively perform the function of:—Fairing the surface; protection against atmosphere; transmission of shear stresses; accommodation of pressure; retention of buoyant gas.

The single metal surface in the metalclad ship performs all these functions, and performs each of them in a better way. In the fabric ship the rigid frame members receive no substantial support from the fabric due to its varying tension with change in weather conditions.

The metalclad ship is a single structure unit in which the surface plating carries a considerable portion of the direct stresses. The metal plating, which is the outer cover, is the principal strength member, and is also the gas container.

Excess Weight Handicap Disappears with Size

The major problems of metalclad design and construction investigated were:—The problems of weight; method of erection; method of joining sheets; methods of attaining gas tightness; corrosion of the thin hull plating; fatigue of the metal plating under vibration, and its effect upon the gas tightness of the seam. Each of these



Unusual Interior View of Metalclad Airship ZMC-2. The metal is strong enough to sustain the full weight of men shown in the picture.

problems was taken up in turn and solved, and thoroughly tested in the laboratory, before any actual construction was considered.

A study of weights of metalclad construction showed that for large sizes of moderate speeds the weights of a fabric-covered ship would be equalled, and that for large sizes of high speeds (100 m.p.h. and over) the metalclad held promise of being superior to the fabric-covered ship, particularly from a weight consideration.

It was decided that the hull could best be erected vertically in sections. Using this method, it was logical to assemble the hull plating from a series of transverse rings, which, in the vertical position, were then parallel to the floor. The hull sections, then being suspended from the hangar roof, could be raised and the successive transverse rings assembled from the floor, raising the section with the addition of each ring. After assembling a section of hull plating, the internal framing could be expanded tightly into place and riveted to the plating. When each section was completed, it could be turned into the horizontal position and the various sections joined together to form the complete hull. This method was executed in the construction of the first experimental metalclad substantially as dictated by early engineering study, and proved a practical method of construction.

Automatic Riveting Machine

The joining of the thin sheets of hull plating, it was decided, could best be done by riveting. An automatic riveting machine was developed employing a new principle in riveting, a remarkable achievement and an economic necessity in the construction of large size metalclad airships.

In its operation, three strands of wire are fed like thread into the machine and three rows of rivets are "sewed"

simultaneously. The machine shears off the wire, rivet length. The tiny wire sections are punched through the two sheets of metal and the revolving cams head up the rivets. The spacing of rivets is also automatic. With this riveting machine two men are able to accomplish as much work in a given time as 128 men working by hand. It inserts and completes rivets at the rate of about 5,000 rivets per hour. This machine successfully drove about 3,500,000 rivets of 0.035 in. diameter in the hull of the first experimental airship with only one-third of 1 per cent. defective rivets.

After the perfection of the riveted seam it was necessary to find a satisfactory sealing compound to seal the seam gastight. Such a compound with a bitumastic base was finally developed, and laboratory tests indicated a permeability less than other buoyant gas containers.

During this initial period of investigation and development, the best material available was thought to be plain duralumin. Exposure tests were started to determine its resistance to corrosion and various protective coatings were investigated. At the time of starting actual construction of the first experimental metalclad, plain duralumin treated by the anodic process was considered the best material and the best protective coating available.

The thin duralumin sheets and riveted seams were tested to determine the effect of vibration and snap diaphragm action. By a specially designed machine the specimens were subjected to millions of continuous vibrations at high speed, and the conclusion arrived at was that any fatigue of the metal and seams, due to snap diaphragm action, was a very remote possibility.

This exhaustive research occupied seven years prior to the actual construction of the ZMC-2, and has continued without interruption ever since.

First Successful Metalclad, ZMC-2

The first rivet was driven in the bow section on March 7 of 1928, and on August 10 of the following year the ship was completed, inflated with helium, and ready for trial flights. The substitution of alclad sheet for duralumin in the hull covering is explained later.

The internal structure of the ZMC-2 hull is composed of 24 equally spaced longitudinals and 12 circular frames which are riveted to the outer cover of alclad sheet 0.0095 inch thick. Five of the transverse frames are of built-up type heavy girders, braced with wiring in their own planes. These frames carry all concentrated loads due to handling lines, weight of car, engines, fin loads, landing loads, etc. The rest of the structure is built of very light sections primarily designed to maintain the shape of the hull and support the outer cover when the ship is deflated. Three air valves and two gas valves are used, as well as several manholes to provide accessibility to the gas chamber. Handling lines are attached to the fittings on the main wire-braced frames.

The car, or control cabin, is suspended from two main frames near the maximum diameter of the hull. It is 24 feet long and 6.5 feet wide at the maximum section. The structure consists of eight transverse frames and several longitudinals braced by diagonals and covered with 0.014 inch corrugated alclad sheet. Two 220-h.p. Wright Whirlwind engines are suspended from the car by tubular outriggers. The bow of the car is occupied by the pilots, navigation and radio equipment, while in the stern are disposed the gasoline and ballast tanks. The total fuel capacity is 250 gallons. The mechanic's controls, instruments and seat are placed in the middle, and the landing gear is attached to the bottom of the car. A handling rail is provided on each side for ground handling by the landing crew.

The ballonets, made of two-ply rubberised fabric, are located inside the hull, forward and aft of the car. The ballonets are interconnected by a duct system, into which air is supplied by scoops. One dynamic scoop is located at the forward end of the car and two propeller scoops on the outriggers. An auxiliary hand-operated blower is also provided in the car to maintain pressure during ground handling.

Fins

Instead of the conventional four-fin arrangement, the ship is equipped with eight fins equally placed around the circumference, four of them acting as vertical surfaces and the other four as horizontal surfaces. This arrangement of fins allows a higher aspect ratio than is customary, thus giving unprecedented efficiency to the fin group as a whole. The fins are mounted to two hull frames and are braced by streamline wires. To the trailing edge of the fins are attached movable control surfaces, which are operated by cables running to the car. The structure of the fins is

covered with corrugated alclad sheet of an average thickness of 0.008 inch.

The general characteristics and performance data of the ZMC-2 airship are given in the following tables.

GENERAL CHARACTERISTICS OF THE ZMC-2 METALCLAD.

Length of hull	149 ft. 5 in.
Diameter of hull (max.)	52 ft. 8 in.
Fineness ratio	2.83
Displacement of hull	202,200 cu. ft.
Total ballonet displacement	50,600 cu. ft.
Front ballonet displacement	22,600 cu. ft.
Rear ballonet displacement	28,000 cu. ft.
Ratio of ballonet volume to hull volume	25 per cent.
Thickness of skin	0.0095 in.
Length of car	24 ft.
Width of car	6 ft. 6 in.
Number of air valves	3
Number of gas valves	2
Number of fins	8
Total fin area	440 sq. ft.
Total elevator area	190 sq. ft.
Total rudder area	95 sq. ft.
Total automatic rudder area	95 sq. ft.
Engines (Wright Whirlwind J-5)	2
Power at 1,800 r.p.m.	440 h.p.
Propeller diameter (all metal)	9 ft. 2 in.
Lineal feet of seam	17,600 ft.
Surface area	19,436 sq. ft.

PERFORMANCE DATA OF THE ZMC-2 METALCLAD

Gross lift (100 per cent. inflation with 92 per cent. pure helium at 60° F. and 29.92 in. Hg.)	12,242 lb.
Weight empty	9,115 lb.
Useful load	3,127 lb.
Crew (three)	600 lb.
Fuel (200 gal.)	1,200 lb.
Oil (25 gal.)	200 lb.
Ballast (50 gal.)	420 lb.
Passengers and cargo	707 lb.
Range with 250 gall. (cruising speed)	760 m.
Maximum possible range (still air)	1,120 m.
Maximum speed at 440 h.p.	70 m.p.h.
Cruising speed at 220 h.p.	56 m.p.h.
Static ceiling	9,000 ft.

Alclad Substitute for Duralumin

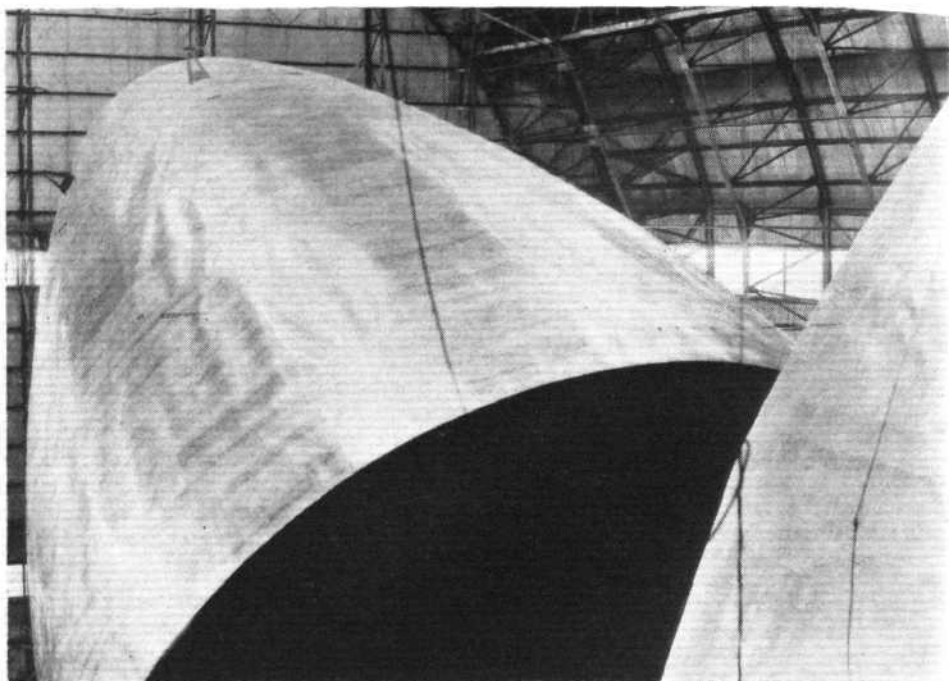
The original specifications of the ZMC-2 provided for a hull covering of plain duralumin 0.008 inch thick. It was the first time that sheet of this thickness had been rolled in commercial sizes, consequently its resistance to corrosion was not definitely known. Through the co-operation of the British Air Ministry the anodic process developed in England was made available, and the sheet metal was given this treatment. When the hull of the ship was one-fourth completed, exposure tests conducted by the Bureau of Standards had progressed to the point where an appraisal could be made of corrosion and embrittlement of the material.

Six months' exposure revealed that a serious deterioration resulting from inter-crystalline attack had occurred, the tensile strength, 60,000 lb./in.², dropping to 50,000 lb./in.² and the elongation, originally 15 per cent., diminishing to 4 per cent. It was evident that this was not a safe



Forward View of Car showing two Wright J-5 Whirlwind Engines of 220 h.p. each.

View of the two halves while turning from vertical to horizontal position.



material with which to proceed, so construction was temporarily halted. It was concluded, however, that the failure was due to the thinness of the sheet, and was not attributable to the anodic process, its value for certain protective purposes having been previously demonstrated with relatively thicker gauges of metal.

Fortunately, the development and testing of "Alclad" 17St Alloy by the Aluminum Company of America had progressed to a point where its superior resistance to intercrystalline corrosion might be accepted as an assured fact. "Alclad" might be described as a "duralumin sandwich," the meat or core being plain duralumin coated on each side with pure aluminium. Theoretically, the pure aluminium is electro-negative to the aluminium alloy, and in the case of galvanic action acts as a barrier to corrosion of the core. The aluminium coating thus serves as a guard against corrosion, similar to the action of zinc on steel. In view of the obvious advantages of this new metal, it was decided to scrap the partially-completed hull and start over again, substituting 0.0095 "Alclad" for 0.008 duralumin.

Full Size Section of Hull Tested

Incidentally, this gave an opportunity to test the discarded stern to destruction in order to prove design theories with a full-size section 29 feet high and 34 feet in diameter and weighing about 400 lb. The lower edge of the vertical section was embedded in a concrete ring weighing 56,000 lb., and made airtight by a water seal at the bottom. It was then inflated with hydrogen and tested for gas tightness. Samples of gas, to determine its purity, taken at intervals and at different places on the hull, an external soap film test and the use of leak detectors, all confirmed the theoretical gas tightness beyond expectations.

One of the most interesting features of the test was the behaviour of the stern section with internal pressure reduced to approximately 0.3 in. below atmospheric. Hydrogen was first displaced with air, for safety purposes, and artificial suction created. Naturally, the sheet metal folded in between the longitudinals, producing long wrinkles. The longitudinals straightened out, losing their convexity between transverse frames. Many of the folds of the plating were so sharp that it seemed the metal was permanently distorted, and that reintroduction of pressure in order to restore the plating to its original contour would cause a fracture or failure. On the contrary, when the pressure was again raised to 2 in. H_2O above atmospheric, the shape of the stern was so perfectly restored that it was almost impossible to ascertain where the buckles had occurred.

During this experiment some of the longitudinals were found to have been broken by the bending movement to which they had been subjected, while the section was under suction. In his report on this punishing test, C. P. Burgess emphasised the fact that the behaviour of the structure as a whole indicated that, although some of the longitudinals failed, the stressed skin evidently was very effective in supporting the internal structure against complete collapse and failure. This is another most desirable advantage of the monocoque self-contained structure of the metalclad that cannot be too highly valued.

Next the hull section was subjected to a distributed side load of 2,650 lb., thus approximating a condition of bending in excess of that occurring in the actual ship. The interior pressure was varied from - 0.3 in. of water to + 13.0 in. of water, and the test indicated a longitudinal stress safety factor of 9. At the high pressure of + 13.0 in., the 400-lb. section actually lifted the 56,000-lb. concrete ring from the floor, breaking the water seal, thus

releasing the compressed air with a sudden rush. This was considered a most remarkable demonstration of superior strength, and enabled the builders of the ZMC-2 to proceed with its construction with utmost confidence.

Completion

The completion and trial flights in August, 1929, demonstrated the soundness of the theories involved in the ZMC-2. This novel ship, when completed, was actually 127 lb. under contract weights. It fulfilled every contract requirement on the first attempt with a safe margin over. Under maximum adverse conditions, combined with internal pressure of 4 in. of water, the factor of safety of the hull plating in the longitudinal direction is over 10 and in the transverse direction is 5.0. The smallest factor of safety in the girders is 4.7. These high safety factors are dictated by the minimum thickness of sheet metal available, which is out of proportion to the small size of this ship.

Helium Diffusion Low

Measurement of the diffusion during the trial flights of the ZMC-2 indicated an average loss of about 200 cubic feet of helium per 24 hours. In lift this represents 12 lb. loss, and, applied to the surface area, it represents 3 litres per square metre per 24 hours. At the present time, after over 500 hours of flight operation and two years after the completion of the ZMC-2 hull, the Navy log book shows an average daily loss of lift of about 16 lb. This is equivalent to a loss of 258 cubic feet of helium and in area represents a diffusion of about 4.0 litres per square metre per 24 hours, or the equivalent of aged goldbeater skin.

It is believed to be a fair assumption that at least one-half this leakage is due to valves and fabric envelope of the ballonets. The fact that the ZMC-2 is used for training and for experimental purposes aggravates the loss of helium also. Therefore, in view of this assumption, it is submitted that a fair estimate of diffusion through seams of the two-year-old metal is from 1.0 to 2.0 litres per square metre per 24 hours, or an average of 10 lb. per 1,000 ft.² per annum. This represents an annual loss of only 16 per cent. of the total lift of the ship.

It should be emphasised that in a large metalclad of commercial size the rate of diffusion would decrease for several reasons. The valves and accessories would be relatively lower in number and larger in size. New material showing marked improvement over rubberised fabric in gas tightness is now available and would be used for ballonets. But most important of all, in the larger sizes of ships the ratio of hull area to total volume decreases, and likewise the ratio of total length of seams to hull area decreases still more, inasmuch as thicker sheets are rolled in greater width. This reduces the area of critical exposure, thus again reducing the loss of helium.

(To be continued.)

THE ROYAL AIR FORCE

London Gazette, May 12, 1931

General Duties Branch

Lt. W. S. Lea, R.N., is re-attached to R.A.F. as Flying Officer with effect from April 21, and with seny. of Aug. 18, 1925. The follg. Pilot Officers are promoted to rank of Flying Officer:—L. Crocker (Jan. 27); M. V. Johnstone (April 11); L. E. P. Mahon (April 11). Wing Commander E. B. Beauman is placed on half-pay list, scale B (April 30). The follg. Flying Officers are transferred to Reserve, Class A (May 8):—M. R. Edmondson (Lt., R.A., T.A.), C. H. Hockly, A. M. D. Howes, G. H. G. S. Jenkins, P. G. Lucas, K. C. Netherton, R. H. C. Taylor, E. D. Turner. Flight-Lieut. H. A. J. Wilson, O.B.E., is placed on the retired list on account of ill-health, and is granted permission to retain the rank of Squadron Leader (May 10); Flying Officer B. F. O. Smith relinquishes his short serve comm. on account of ill-health (May 8); Mate W. G. Boaks, R.N., Flying Officer, R.A.F., relinquishes his temporary comm. on return to Naval duty (May 7).

Medical Branch

The follg. Flight Lieutenants are promoted to rank of Squadron Leader (May 8):—W. E. Barnes, M.R.C.S., L.R.C.P., C. A. Lindup, M.R.C.S., L.R.C.P.

Memoranda

740505 Flight Cadet Edward Alfred Knight is granted an hon. commn. as Sec. Lt. with effect from date of his demobilisation. The permission granted to N. S. Willey to retain the hon. rank of Sec. Lt. is withdrawn on his conviction by the Civil Power (April 14).

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The follg. Flying Officers are transferred from Class A to Class C:—J. W. Duggan (May 9); J. L. Mayer, D.F.C. (March 23). Flying Officer T. B. Byrne is transferred from Class C to Class A (Feb. 20); Flying Officer E. K. Rayson is transferred from Class C to Class AA (ii) (Jan. 13). *Gazette* April 28 concerning Pilot Officer G. B. Shields is cancelled.

AUXILIARY AIR FORCE

General Duties Branch

No. 601 (COUNTY OF LONDON) (BOMBER) SQUADRON. Pilot Officer R. Y. Sanders resigns his commission (Feb. 6.) No. 604 (COUNTY OF MIDDLESEX) (BOMBER) SQUADRON. G. S. Wellby to be Pilot Officer (April 21).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commanders.—H. I. Hammer, D.F.C., to No. 503 Sqn., Lincoln, pending taking over command, 1.5.31. J. C. Quinell, D.F.C., to School of Naval Co-operation, Lee-on-Solent, to command, 2.5.31.

Flight-Lieutenants: C. Hallawell, to No. 58 Sqn., Worthy Down, 28.4.31. H. A. Haines, D.F.C., to R.A.F. Depot, Uxbridge, 14.4.31. J. H. Hutchinson, to No. 32 Sqn., Kenley, 5.5.31. P. W. Lowe-Holmes, to No. 23 Sqn., Kenley, 2.5.31. J. B. H. Rogers, to Experimental Section, Royal Aircraft Estab., S. Farnborough, 7.5.31.

Flying Officers: N. R. Buckle, to Station Flight, Upper Heyford, 5.5.31. J. S. Pole, to Station Flight, Duxford, 3.5.31. D. P. Lascelles, to Central Flying School, Wittering, 4.5.31.

Pilot Officers: N. E. Morrison, to R.A.F. Depot, Uxbridge, 22.3.31. The undermentioned are all posted to No. 3 Flying Training School, Grantham, with effect from 25.4.31:—R. K. Brougham, G. H. Davies, G. H. Denholm, I. A. Dixon, D. L. Dustin, W. N. Elwy-Jones, A. W. M. Finny, M. H. Formby, H. R. Graham, R. H. Hobbs, S. Keane, J. H. Linggard, J. Meares, J. D.

Miller, S. M. Moseley, D. H. Oxley, D. Scorgie, S. E. R. Shepard, F. W. C. Shute, L. C. Snee, A. H. J. de P. Smith, E. A. Springall, J. F. Stephens.

Stores Branch

Flight-Lieutenant P. F. Connaughton, to R.A.F. Depot, Uxbridge, 12.4.31.

Accountant Branch

Flying Officer R. L. M. Hall, to R.A.F. Depot, Uxbridge, 14.4.31.

Medical Branch

Squadron Leader E. W. Craig, M.C., to Medical Training Depot, Halton, 18.5.31.

Flight-Lieutenants: A. Harvey, to R.A.F. Practice Camp, North Coates Fitties, 11.5.31. C. W. Coffey, to H.Q., Iraq Command, Hinaidi, 1.5.31.

Flying Officer H. T. Ryland, to R.A.F. Hospital, Cranwell, 13.5.31.

NAVAL APPOINTMENTS

The following appointments were made by the Admiralty:—**Lieutenants (F.O., R.A.F.):** C. W. Byas, R. A. Kilroy, H. D. Barlow, and C. A. Kingsley-Rowe, to *Victory*, for 402 Flight.

IN PARLIAMENT

Bombay Air Mail Service

THE SECRETARY OF STATE FOR INDIA (Mr. Wedgwood Benn), on May 11, in reply to Mr. Day and Major G. Pole, said the Government of India hope that it will be possible to provide an air mail service for Bombay at a date not long after the inauguration of the Karachi-Calcutta sector as a State air service. The technical details involved are under investigation in India. It has not yet been decided whether the service should be operated as a shuttle service from Jodhpur to Bombay, or as a more direct connection from Karachi to Bombay. I imagine it will be run by the Government.

Indian Air Force

MR. BENN, in reply to Lt.-Com. Kenworthy said, what is contemplated is the creation of an Indian Air Force as a new and separate service. It will be formed on a combatant basis under the command of the Air Officer Commanding in India, with the prospect that in due time it will share responsibility for the air defence of India with the Royal Air Force establishment in India. It will be manned exclusively by Indian officers and airmen, although provision will be made for the attachment of Royal Air Force officers and non-commissioned officers to supervise and assist in the development of the

force in its early stages. It will consist of one flight, with a small headquarters' staff, in the first instance, with the prospect of expansion to a full squadron later.

R.A.F. Collisions

MR. MONTAGUE, on May 14, in reply to Mr. Ramsbotham, said during the last 12 months 12 collisions in mid-air involving 11 deaths have occurred between Royal Air Force aeroplanes. The original price of the machines involved in these accidents was roughly £50,000, but the actual value at the date of loss is, of course, very much less; the value of the parts salvaged cannot be estimated without undue labour. The question of the prevention of accidents is one which engages continuous attention, with a view to safeguarding by all means in their power the lives of flying personnel. Every individual accident is studied in detail at the Air Ministry with the utmost care, with a view to the incorporation in training instructions of any lessons which may be learnt from it. The attention of all concerned has recently been again specially drawn to the Regulations which are designed to reduce to a minimum the risk of collision.

Inter-College Athletics—Fine Show by Cranwell

SANDHURST, Woolwich, and Cranwell Colleges met on Saturday, May 9, for the fifth athletic meeting between the three. The meeting was held at Uxbridge. Sandhurst won the meeting on points. Since the triangular contests were started in 1927, Sandhurst has won every year except in 1930, when Woolwich headed the list. In all the other years Cranwell has been second, and Woolwich third. Cranwell, in fact, is always on the heels of Sandhurst, but has not yet been able to catch up the R.M.C. Last year the scores were Woolwich, 65; Sandhurst, 63; and Cranwell, 61. That was a very fine contest. This year was even better, though the bottom college, Woolwich in this case, was further behind the other two. The scores this year were:—

Sandhurst, 69; Cranwell, 67; Woolwich, 52. This order is due to the method of scoring; and another method would have put Cranwell at the head of the list. Actually, Cranwell scored four firsts to Sandhurst's three and Woolwich's one. Sandhurst made up by its "placed" men, securing four seconds and three thirds, which certainly shows a fine average of athletic merit. But there was very little in it (to be exact, only 2 points), for Cranwell had three seconds and two third places. The meeting was notable, not only for the close scoring of the two leading colleges, but for the excellence of the performances. Two of the records of the meeting were broken, one by Cranwell and one by Sandhurst. Flight Cadet T. A. B. Parcell won the quarter mile in 50½ secs., which was better by ½ sec. than the previous best for the meeting. The other record was established in the mile, which was won by G. C. Rush, of Sandhurst, in 4 min. 28 sec., after a most exciting race with C. G. Buttenshaw, of Woolwich. Parcell may be called the hero of the meeting, for in addition to his record quarter, he also won the 100 yards in the very good time of 10½ sec., and took part in the long jump. Had the quarter been the first event, instead of coming after the 100 and long jump, the record might have been still further lowered.

The results were:—
100 Yards.—T. A. B. Parcell (Cheltenham and Cranwell), 1; J. M. Lind

(Ampleforth and Sandhurst), 2; S. J. Marchbanks (Owens and Cranwell), 3. Won by a yard. Time, 10½ sec.

High Jump.—D. N. Deakin (Stowe and Woolwich), 5 ft. 8 in., 1; P. A. Duke (Dover and Woolwich), 5 ft. 5 in., 2; G. H. A. Yates (Bloxham and Sandhurst), 5 ft. 3 in., 3.

One Mile.—G. C. Rush (Malvern and Sandhurst), 1; C. G. Buttenshaw (Sherborne and Woolwich), 2; W. R. Brotherhood (Monmouth and Cranwell), 3. Won by a yard. Time, 4 min. 28 sec. (a record).

Long Jump.—P. J. Lewis (Harrow and Sandhurst), 20 ft. 11½ in., 1; A. R. Rundle (Brighton and Cranwell), 20 ft. 8½ in., 2; S. P. Reed (Rugby and Woolwich), 20 ft. 3½ in., 3.

440 Yards.—T. A. B. Parcell (Cheltenham and Cranwell), 1; S. J. Marchbanks (Owens and Cranwell), 2; O. Goldsmith (Cheltenham and Sandhurst), 3. Won by 10 yards. Time, 50 sec. (a record).

Putting the Weight.—A. J. A. Watson (Abingdon and Sandhurst), 39 ft. ½ in., 1; A. M. Doran (Sedburgh and Cranwell), 35 ft. 7 in., 2; D. H. B. Courtenay (Blundell's and Sandhurst), 30 ft. ½ in., 3.

120 Yards Hurdles.—R. A. C. Carter (Portsmouth and Cranwell), 1; N. S. Pope (Charterhouse and Sandhurst), 2; A. T. Hingstone (Woolwich), 3. Won by half a yard. Time, 17½ sec.

Two Miles.—J. M. L. Gavin (Uppingham and Woolwich), 1; P. D. Daly (Clifton and Sandhurst), 2; R. H. Metherell (King's College and Sandhurst), 3. Won by 10 yards. Time, 10 min. 17½ sec.

Half-mile.—S. J. Marchbanks (Owens and Cranwell), 1; T. P. H. du Boulay (Wellington and Sandhurst), 2; L. H. Lewin (Wellington and Woolwich), 3. Won by a yard. Time, 2 min. 3½ sec.

The Royal Air Force Memorial Fund

THE usual meeting of the Grants Sub-Committee of the Fund was held at Iddesleigh House on April 30. Mr. W. S. Field was in the chair, and the other members of the Committee present were:—Mrs. L. M. K. Pratt Barlow, O.B.E., Air Commodore B. C. H. Drew, C.M.G., Lieut.-Comdr. H. E. Perrin, Squadron Leader A. H. Wann. The Committee considered in all 17 cases, and made grants to the amount of £253 1s.

Interchangeability

A NOVEL test which demonstrated the exceptional interchangeability of the Bristol Jupiter series F engine was recently carried out at Bristol under the control of the resident Inspector of the Aeronautical Inspection Directorate. This was designed to demonstrate the interchangeability of components and sub-assemblies of the same type from one engine to another, and also the interchangeability of components taken from the spare parts stores. Six engines were allocated, three being the Jupiter series VII F. supercharged type, and three the Jupiter series VIII F. geared type.

After these engines had completed their endurance tests, they were completely stripped and laid out separately in their various units and component parts. The engines were then taken over by the A.I.D. Inspectors, and it was left with them to deal with the interchanging of components. After the engines were reassembled, the Bristol Co. were informed that an interchange of no less than 1,500 parts had been effected. This reassembly was carried out without any difficulty or extra fitting adjustment. The assembled engines were then submitted to further endurance and performance tests, and again stripped down and inspected. The results were striking, for of the 1,500 parts interchanged the only part rejected was a hand-starter bevel pinion replaced owing to the uneven bearing of the teeth. The most conclusive part of the demonstration was afforded by the fact that the six engines with the interchanged parts were afterwards accepted by the Air Ministry without question.

The Guild of Air Pilots and Air Navigators

It is not generally realised that all commercial pilots holding "B" licences are eligible to join the Guild as Associates without waiting for five-year qualifications. The Associateship gives all privileges of membership except voting rights, and the annual subscription is £2 2s.

Air Navigators' Examination: Successful Candidates

THE Air Ministry announces:—The following candidates, whose names are given in alphabetical order, have passed the examination for Second Class Civil Air Navigators' Licences, held on March 30 and 31, and April 1 and 2, 1931:—

Candidates examined at London.—Sgt. S. A. C. Baker, Lt.-Commr. G. D. Dudgeon-Stretton, R.N., Dr. C. C. Fenton, Capt. G. W. Ferguson, Mr. E. Fulford, Flt.-Lt. G. L. Gandy, Sgt. J. P. Kirton, Flt.-Lt. H. G. Loch, Mr. C. W. Martin, Mr. J. K. Morton, F/O. J. S. Newall, Flt.-Lt. H. M. Schofield, Flt.-Lt. J. H. Sender, Mr. J. Spafford, Flt.-Lt. G. I. Thomson, F/O. F. Townsend, Flt.-Lt. C. F. Uwins.

Candidates examined at Cairo.—F/O. A. K. H. Binley, Flt.-Lt. S. J. Stocks.

Candidate examined at Baghdad.—Mr. P. J. Tweedie.

The subjects of the examination were:—International legislation—Form of the Earth, Maps and Charts—Meteorology—Dead Reckoning and Direction Finding W/T Navigation—Magnetism and Compasses—Visual Signalling: Morse Flashing, Semaphore and International Procedure. Forty-one candidates were examined at the London centre, four at Cairo and one at Baghdad.

Handley Page Slots for Switzerland

THE Federal Military Department of Switzerland has adopted the Handley Page slotted wing device, which will be fitted to certain types of Swiss aircraft.

Mr. Punch's Good Joke

JUST as we had re-lit our office fires we received the welcome copy of *Punch Almanack*—sorry! we mean *Summer Number*. While we received it coldly, by the time we had finished looking through its 48 pages (excluding advertisements) of black and white and coloured fare, we were well warmed up with laughing. If *Summer* has not come, a good substitute has—and ridiculously cheap at one shilling!

Models: Wakefield International Cup Trials

THE above trials, which were postponed on Saturday, May 16, owing to the weather, will be held on Saturday, May 30, on Wimbledon Common from 3 p.m. to 6 p.m. The postponement has made time very short, and models to be sent to America will be chosen, if at all possible, immediately after the trials. Successful competitors will be asked to let Mr. W. E. Evans, of the Society of Model Aeronautical Engineers, have their models on Monday, June 1, packed in a box with instructions for the help of those who will be flying them in America. Should the trials have to be postponed again on May 30, they will be held on Sunday, May 31.

PUBLICATIONS RECEIVED

Aviation. By Bradley Jones. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Price 13s. 6d. net.

The Alliance Record. March, 1931. Printing Trade Alliance, 8, Farringdon Avenue, London, E.C.

Aluminium: Its Production, Properties and Application. The British Aluminium Co., Ltd., Adelaide House, King William Street, London, E.C. 4.

Hints for Commercial Visitors to Portuguese West Africa. No. C.3467. Department of Overseas Trade, 35, Old Queen Street, London, S.W. 1.

The Air Weapon. By C. F. Snowden Gamble. Vol. I. Nov., 1783–Aug., 1914. Oxford University Press. London: Humphrey Milford. Price 12s. 6d.

Aerial A.B.C. December, 1930–February, 1931. *Aerial A.B.C., Ltd.*, 4, Duke Street, Adelphi, London, W.C. 2. Price 1s.

A.B.C. of Gliding and Sailflying. By Major V. W. Page. London: Chapman and Hall, Ltd. Price 10s. 6d. net.

Transactions of the Institution of Engineers and Shipbuilders in Scotland. Vol. LXXIV. Part IV. Feb., 1931. Institution of Engineers and Shipbuilders in Scotland, Elmbank Crescent, Glasgow. Price 5s.



NEW COMPANIES REGISTERED

AERONAUTICAL EDUCATIONAL TRUST, LTD., 102, Sidney Street, Chelsea, S.W. 3.—Capital £2,000 in 1s. shares. Under agreement with Brooklands Aviation, Ltd., and British School of Motoring, Ltd. Instructors in aviation, aerial navigation, aerial and ground signalling, dealers in and importers and exporters of aircraft and aircraft engines, transporters of passengers and goods by air, etc. Directors: H. D. Davis. S. C. H. Roberts. 15, Cathedral Mansions, Victoria, S.W. (principal of the Automobile Engineering Training College). E. A. Jones (c/o Brooklands Aviation, Ltd., Brooklands Aerodrome, Byfleet, Surrey), director, and flying instructor. G. D. Duguid. A. P. Bradley. All the above directors shall retire at the first ordinary general meeting, and thereafter, unless or until the company otherwise determine, two directors shall be appointed by Brooklands Aviation Ltd.; two by British School of Motoring, Ltd.; and one by Brooklands Estate Co.

BENNIE S. COHEN AND SON (AVIATION INSURANCE), LTD., 39, Lombard Street, E.C. 3.—Capital £1,000 in £1 shares. Under agreement with Bennie S. Cohen and Son, Ltd., insurance brokers and agents, etc. Directors: E. L. Lumley (chairman), "Oakhurst," Hildenborough, Kent; (director, Bennie S. Cohen and Son, Ltd.). E. J. Quarrington, 11, Shirley Road, Wallington, Surrey; (director, E. J. Quarrington and Co., Ltd.).

SCARBOROUGH AERO CLUB CO., LTD., Greensmith Chambers, 29, St. Nicholas Street, Scarborough.—Capital, £1,000 in £1 shares. Objects: to establish and maintain a flying club in Scarborough or elsewhere. Directors: A. E. Thompson, 67, Esplanade, Scarborough, motor engineer. R. P. Robinson, 79a, Waterhouse Lane, Scarborough, motor engineer. A. B. Smith, 1, Royal Crescent, Scarborough, traveller. H. Scriminger, Mayfield, Seamer, Yorkshire, entertainment manager.

TECHNICAL LIGHTS AND EQUIPMENT CO., LTD., Audrey House, Ely Place, E.C. 1.—Capital £100 in £1 shares. Manufacturers, assemblers and marketers of marine, aviation and other technical equipment as formerly carried on by G. Davidson. Sole director: G. Davidson, 156, Sloane Street, S.W. 1.



AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors. The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

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